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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 3295
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3295
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3298

89 ASTRONOMY 3299
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3300
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3300
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3301
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3302
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 3303

Note: N.A. means that no abstracts were assigned to this category for this issue.

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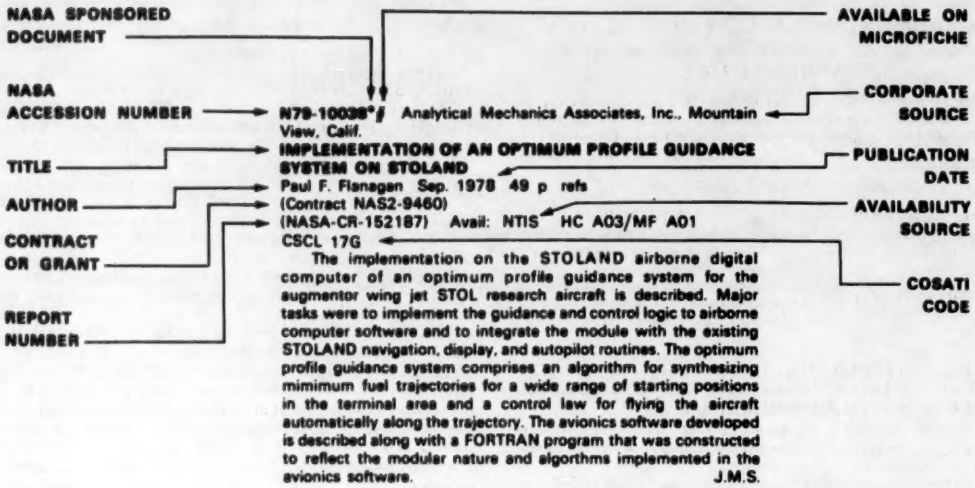
TYPICAL CITATION AND ABSTRACT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N79-10038*# Analytical Mechanics Associates, Inc., Mountain View, Calif.
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TITLE
IMPLEMENTATION OF AN OPTIMUM PROFILE GUIDANCE SYSTEM ON STOLAND
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The implementation on the STOLAND airborne digital computer of an optimum profile guidance system for the augmentor wing jet STOL research aircraft is described. Major tasks were to implement the guidance and control logic to airborne computer software and to integrate the module with the existing STOLAND navigation, display, and autopilot routines. The optimum profile guidance system comprises an algorithm for synthesizing mimimum fuel trajectories for a wide range of starting positions in the terminal area and a control law for flying the aircraft automatically along the trajectory. The avionics software developed is described along with a FORTRAN program that was constructed to reflect the modular nature and algorithms implemented in the avionics software.
J.M.S.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects— not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, EXPERIMENTAL STUDIES OF ROTORS
K. Karamcheti, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCC 2 13)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0002, EXTENDED LIFE AEROCONICAL PARACHUTE
G.R. Drew, U.S. Dept. of Defense, Navy, National Parachute Test Range, *El Centro, California* 92243 (DN895417)

Establish feasibility of sealed plastic technology/vacuum packaging of the aeroconical parachute canopy for extended service in the operational environment.

Hermetically sealed vacuum/pressure packaging techniques and aerospace plastics will be applied to packaging the new aeroconical parachute. 'One-time' factory packaging with strict Q.C. will be used to obviate the necessity for repacking. Test units will be manufactured, and subjected to environmental, flight tests and ejections to prove the concept feasible.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0003, EMISSION LEVELS AND AIR QUALITY EFFECTS FROM NAVAL AIR STATION AIRCRAFT OPERATIONS AND TEST CELLS
D.W. Netzer, U.S. Dept. of Defense, Navy, Naval Postgraduate School, *Monterey, California* 93940 (DN898052)

(a) Develop and experimentally validate a computer model which can be used to assess the effects of engine operating conditions and turbojet test cell design on the flow field and engine exhaust distribution within the test cell, augmentor and exhaust stack, (b) experimentally determine the effects of test cell design and engine operating characteristics on pollutant concentrations in the exhaust stack, (c) develop an air quality assessment model for U.S. Navy operations.

(a) Adapt the Spalding PISTEP II and CHAMPION computer codes to the test cell geometry and operating conditions, (b) design, construct and utilize a 1/8-scale turbojet test cell to validate models and to determine optimum designs for pollution abatement, (c) modify the U.S. Air Force developed AQAM model to incorporate operation peculiar to U.S. Navy operations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0004, AIRCRAFT FUEL TANK ENVIRONMENT/THREAT EFFECTS MODEL FOR VULNERABILITY ASSESSMENT
L. Mahood, Falcon Research & Development Co., *1225 S. Huron St., Denver, Colorado* 80223 (DF457080; F33615-74-C-2057)

The objectives of this program are - 1. To collect and analyze existing data that relates to aircraft fire and explosion and to develop probability of fire and explosion information which is applicable to existing vulnerability analysis programs, 2. Review current vulnerability analysis programs and determine their usefulness for predicting probability of a fire and explosion, and 3. Develop a computer program and associated models which incorporate the germaine parameters necessary to predict fire and explosion factors in a realistic military aircraft combat environment.

The program shall consist of four tasks - Task I shall consist of a review and analysis of existing data related to fuel system fire and explosion hazards. Task II shall consist of a review and analysis of current existing computer programs for vulnerability analysis. Task III shall constitute the majority of the effort. It shall be directed towards the detailed investigation of the parameters that affect the probability of a fire or explosion within aircraft in a combat environment. Task IV will involve the check-out and refinement of the computer program developed in Task III. The fire and explosion probability information developed in Task I should be directly applicable to the type vulnerability programs studied in Task II as well as a departure point for Task III. The computer program resulting from Task III should, if possible, be applicable to the vulnerability programs of Task II, however, this should not be considered as a constraint. The results of Task II should establish how the results of Task III may be utilized in assessing total aircraft vulnerability.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aero Propulsion Lab.

1.0005, DIFFERENTIAL PRESSURE TRANSDUCER DEVELOPMENT
R. Grannells, United Technologies Corp., Hamilton Standard Division, *Bradley Field Rd., Windsor Locks, Connecticut* 06096 (DN889786; N00140-78-C-0073)

The principal objective of this effort is to develop and demonstrate a high-accuracy differential pressure transducer, designed to sense the fan discharge Mach number in an advanced military aircraft gas turbine engine, and to be used in conjunction with advanced digital electronic fuel controls. The accuracy goal is 1% of point over a range of 0.25 to 25.0 psi differential at absolute pressure levels of 2 to 100 psia. The reliability goal is 100,000 hours MTBF. The response goal is a system time constant less than 20 milliseconds.

This effort will design, fabricate, and test a miniaturized vibrating cylinder pressure transducer. Design optimization for size will be followed by two hardware interactions with breadboard testing. The finalized sensor will undergo performance and environmental testing followed by delivery of two units to NAPC.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0006, AEROACOUSTICS RESEARCH PROGRAM IN JIAFS
H. Liebowitz, George Washington University, School of Engineering & Applied Sciences, *725 23rd St. N.W., Washington, District of Columbia* 20037 (NCC 1 14)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0007, LOW COST COMPOSITE RPV WING
J.J. Grosko, Lockheed Georgia Co., *86 S. Cobb Dr., Marietta, Georgia* 30060 (DF138160; F33657-76-C-0713)

Remotely piloted vehicles (RPV's) are making an increasingly important contribution to our aerospace power. Reducing the acquisition cost of these aircraft is as important as reducing the acquisition cost of larger manned aircraft. The use of advanced composites combined with elastomeric tooling, which does not require an autoclave, holds great promise of reducing the acquisition cost of aircraft structures. Purpose of the program is to demonstrate the cost savings inherent in graphite epoxy structure built with elastomeric tooling. Data and procedures developed under this program will be directly applicable to all structures using fibrous epoxy construction. Qualification of this fabrication technique will result in substantial cost savings for all fibrous epoxy structures as well as an estimated 35 percent cost savings on the RPV wing.

A graphite epoxy wing will be designed and fabricated using elastomeric tooling. It will undergo static load testing and ground vibration testing, and then be flight tested on a BGM-34C test vehicle. Quantitative measurements of flight loads and structural deflections will be made. The design and fabrication of the wing will be contracted. The integration and flight testing will be performed by AFFDL personnel.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0008, DETERMINATION OF MOISTURE CONTENT IN COMPOSITES BY DIELECTRIC MEASUREMENT
L. Hammond, Lockheed Georgia Co., *86 S. Cobb Dr., Marietta, Georgia* 30060 (DF142160; F33615-78-C-3216)

This work effort supports aircraft structural integrity requirements of MIL-STD-1530A. Since absorbed moisture in composite structures degrades matrix dominated properties, it is important to know the amount of moisture absorbed in service if overly conservative designs are to be avoided. The objective of this work is to evaluate a unique moisture content sensor based on correlation of dielectric property changes with absorbed moisture content. Development and validation of the moisture content sensor will lead to lower cost, safer and more reliable composite aircraft structures.

Composite specimens with embedded capacitance sensors will be fabricated. They will be moisture conditioned. Sensor readings will be correlated with moisture content.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0009, OPTICAL CABLE SYSTEMS FOR NAVAL AIRCRAFT
R.S. Katz, U.S. Dept. of Defense, Navy, Naval Avionics Facility, *Indianapolis, Indiana* 46218 (DN030051)

To support advanced aircraft electrical system (AAES) program for development of a fiber optics (FO) data transfer system that satisfies solid state electric logic (SOSTEL) and general purpose multiplex system (GPMS) requirements.

(1) Establish requirements, select components for demonstration FO data bus system for SOSTEL-GPMS; (2) establish interface requirements and MODEM partitioning approaches; (3) support technology development efforts in contracting and contract monitoring; (4) support the development, testing and evaluation of a demonstration FO data bus system; (5) aid in selection of a flight test candidate system; (6) support the development of FO terminal equipments for flight test.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0010, AN INVESTIGATION OF VORTEX INDUCED AERODYNAMIC CHARACTERISTICS OF SUPERSONIC CRUISE CONFIGURATIONS
C.E. Lan, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NSG 1629)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0011, A RESEARCH PROGRAM TO REDUCE INTERIOR NOISE IN GENERAL AVIATION AIRPLANES
J. Roskam, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas* 66044 (NCC 1 6)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0012, VULNERABILITY REDUCTION OF AIRCRAFT ENGINES
W.S. Thompson, U.S. Dept. of Defense, Army, Armament Research & Development Command, Vulnerability Lethality Div., *Aberdeen Proving Ground, Maryland* 21005 (DA0P4483)

Conduct studies and tests to establish new concepts and evaluation methodology for the reduction of vulnerability in aircraft propulsion systems.

Analyze vulnerability of T700 and T800 engines; conduct projectile and fragment firings against static and dynamic engines; participate with Air Force Aeropropulsion Laboratory in developing a simulator for turbine engine compartment fires.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

1.0013, DISPLAY EVALUATION FLIGHT TEST
F. Hoerner, U.S. Dept. of Defense, Navy, Naval Air Test Center, *Patuxent River, Maryland* 20670 (DN793172)

Design, develop, and install advanced display system in test bed airplane for flight test evaluation.

Specify system, award contract, monitor development and installation of system in test aircraft. Plan and conduct flight test/evaluations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0014, NAVY VEHICLE DESIGN AND CONSTRUCTION - DEVELOPMENT OF VERTICAL TAKEOFF AND LANDING (V/STOL) SYSTEM IDENTIFICATION PROCEDURES
Unknown, U.S. Dept. of Defense, Navy, Naval Air Test Center, *Patuxent River, Maryland* 20670 (DN793249)

The objective of this research program is to develop V/STOL system identification procedures and to demonstrate the capability of recent advancements in this technology to predict V/STOL aerodynamics from flight test data. This includes the development of data analysis procedures and flight test methods in order to improve the Navy's capability to develop VSTOL aircraft. Finally, this program will isolate areas in current system identification technology that require additional research and development.

The integrated systems identification capability at the Naval Air Test Center will be used to its fullest extent to develop this V/STOL analysis capability. The data base for this analysis will primarily be VAK-191B powered lift flight test data (out of ground effect) obtained by the U.S. Navy during a joint program with the German government. Additional flight data will be obtained as required using the AV-8A Harrier currently based at the Naval Air Test Center. Linear and non-linear maximum likelihood parameter identification programs will be used as required to estimate the six degree of freedom aerodynamic force and moment coefficients of the VAK-191B in powered lift flight. The maximum likelihood parameter identification aerodynamic base will be used in a stability analysis to establish the system frequencies which should be excited to maximize parameter identifiability and lead to recommendations for future flight test procedures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0015, MOTION CUING FOR FLIGHT SIMULATORS
W.H. Levison, Bolt Beranek & Newman Inc., *50 Moulton St., Cambridge, Massachusetts* 02138 (DF052530; F49620-78-C-0073)

AF function - this research contributes to knowledge about motion cues in flight simulation. Deficiency - the importance of motion in flight simulators used for training is not conclusive across a wide range of vehicle types and pilot experience levels. This information impacts the simulator investment strategy and must be determined. Objective - this research is designed to provide operator control models for flight simulator motion configurations which will eventually predict learning behavior. How research contributes - these models will be useful in determining the motion cues which should be produced in a flight simulator to achieve an optimum learning outcome.

This work will be accomplished in conjunction with the Aerospace Medical Research Laboratory (AMRL/EMT), Wright-Patterson AFB, Ohio. An automated procedure will be developed for identifying pilot-related parameters for an optimal control model. Experiments examining task load, motion cue utilization, and attention sharing, in two-axis tracking tasks will be analyzed in terms of the model. Sensitive parameters will then be studied in transfer-of-training experiments to describe the utility of motion cues in learning for pilots of differential flight experience.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

1.0016, 4-D INTEGRATED SYSTEM DEMONSTRATION

G. Comegys, Lear Siegler Inc., *4141 Eastern Ave., Grand Rapids, Michigan* 49508 (DF139740; F33615-77-C-3025)

The Air Force function for this effort is to demonstrate the feasibility of real-time, on board four-dimensional trajectory generation and interactive control/display techniques to reduce pilot workload in a tightly controlled tactical network. The problem is the workload demand placed upon the pilot/aircrew by the requirement for real-time redirect when in a tactical military environment. The objective of this effort is to demonstrate the unique interactive flight control and display methodologies to reduce pilot workload required for aircraft control and time oriented navigation management. This effort will reduce pilot workload in a command and control network, and during flight phases where this impact is not available, will contribute to mission effectiveness and survivability.

Perform an experimental simulation program to evaluate and demonstrate the 4-dimensional integrated system as a potential solution to the future close air support mission. The areas to be addressed are functional definition, algorithm development, simulator development and operational concept demonstration. Programs such as the joint tactical information system, global position system, digital avionics information system and digital flight control system will be closely monitored to insure compatibility with these on-going USAF programs.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0017, HIGH ANGLE OF ATTACK DESIGN AERODYNAMICS

M.E. Givan, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DF141390; F33615-78-C-3015)

Historically, fighter aircraft high angle of attack limits have been defined in flight tests with the attendent risk of aircraft loss. The development of rational criteria to accurately predict our combat aircraft performance in the extreme angle of attack range will lessen this danger. The objective of this work effort is to develop high angle of attack design guidelines for future USAF fighter aircraft from a compilation of existing experimental data.

Existing wind tunnel data on the F-4 and F-15 series aircraft configurations will be collected, correlated and analyzed for trends and sensitivities of flying quality parameters to geometry changes. Special attention is to be given to those configuration items responsible for the non-linear flight characteristics observed at high angles of attack.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0018, USE OF FROST SUSCEPTIBLE SOILS IN ROADS AND AIRFIELDS

N. Smith, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (DA0K8146)

To develop design criteria and construction techniques for the use of frost susceptible soils in the construction of roads and airfields in a winter environment.

Maintain liaison with other Corps of Engineer laboratories, government agencies, universities and private industry. Conduct laboratory and field experiments on membranes, sealants, compaction, physical and chemical stabilization, frost susceptibility, freeze-thaw characteristics, and strength properties of fine-grained soils and 'dirty' gravels (high silt and/or clay content gravels). Construct and test pavement sections under static and repetitive loadings when completely and partially frozen and completely thawed. Analyze surface deformation data from Benkelman beam and repetitive plate bearing (RPB) tests to determine in-situ moduli of layered pavement systems for the above conditions. Monitor long term performances of MESL test sections in seasonal frost and permafrost environments.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

1.0019, DEVELOPMENT OF ADVANCED FLIGHT CONTROL ACTUATION SYSTEMS CONCEPT FOR NAVAL A/C

R. Fucht, Bendix Corp., Flight Systems Laboratory, *200 Holister Rd., Teterboro, New Jersey* 07608 (DN881139; N62269-77-C-0171)

The general objective of this task is to examine the broad spectrum of new flight control actuation concepts with respect to potential advantages and interrelationships with other aircraft systems. The resultant effect of these new concepts will be evaluated against projected aircraft mission and maintenance requirements. Recent advancements in on-board computers, electrical power equipment and solid state processing components may offer advantages to new aircraft, especially with growing emphasis on combat survivability and simplified squadron maintenance. The specific objective of this effort is to determine how a contractor-developed actuation concept can be adapted for aircraft primary flight controls. The unique feature of this concept is the use of two different power mediums (electricity and bleed air) to drive a single actuator. This contract supports work unit ZA601, Agency Accession No. DN681080.

An actuator will be designed to T-2C aircraft rudder specifications. It will be fabricated, lab tested and flight demonstrated on a T-2C test bed. Ultimate application is aimed at V/STOL aircraft.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0020, THE PHYSICS OF TURBULENT FLOW

J.A. Johnson, Rutgers the State University of New Jersey, Newark Campus, School of Arts & Sciences, Dept. of Physics, *53 Washington St., Newark, New Jersey* 07102 (NSG 3280)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0021, DEPARTURE TRENDS FOR CCV AIRCRAFT

W. Bihrle, Bihrle Applied Research Inc., *400 Jericho Tpke., Jericho, New York* 11753 (DF133680; F33615-78-C-3600)

One problem area experienced by aircraft designers is their inability to adequately predict high-angle-of-attack characteristics. The mission to be supported is FG02, development and improvement of flight control design techniques. The objective of this effort is to identify trends in the departure characteristics of statically unstable aircraft at high angles of attack. The proposed effort will contribute to a better understanding of expected departure trends and thus provide knowledge to enhance safety of flight and to permit maximum maneuverability.

The departure characteristics of statically unstable aircraft will be evaluated by use of 6-degree-of-freedom digital computer programs. These characteristics will include the effects of variations in key stability and control parameters. The influence of flight control system augmentation including control position and rate limits will be evaluated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0022, NAVTOLAND (NAVY VERTICAL TAKEOFF AND LANDING) CONTROL/DISPLAY CAPABILITY

B. Eulrick, Calspan Corp., *1422 Genesses Ave., P.O. Box 235, Buffalo, New York* 14221 (DN881384; N62269-77-C-0561)

To analyze the trade-offs between flight control and display complexity for V/STOL shipboard landings, and recommend optimum configurations. This contract supports work unit ZA601, Agency Accession No. DN681080.

Through literature searches and evaluation of flight test data, develop a matrix of feasible and practicable control display configurations.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0023, HYDRAULIC DIAGNOSTIC MONITORING SYSTEM

J. Duzick, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN881348; N62269-78-C-0041)

Develop an on-board diagnostic and condition monitoring system for military aircraft to continually monitor and report failures upon landing. The main purpose of the monitoring system is to monitor condition of components and predict eminent failure to prevent in flight failures. This contract supports work unit ZA601, Agency Accession No. 681080.

Sensors and read out panel will be constructed and installed on an F14 simulator for initial check-out and demonstration. The sensors will then be installed in an A6 aircraft for a six-month flight test program.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0024, FORWARD SWEPT WING STUDY

G. Specht, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DF140920; F33615-77-C-3134)

Present capability of high performance aircraft to execute/develop high turning rates during hassle at transonic speeds can still be considered limited. The problem receives much current attention and a radical new approach may be needed to provide the solution. One such approach requires the wings to be swept forward as opposed to conventional aft swept arrangement. Until recently this concept suffered from loss of static stability due to wing tip bending. The recent developments in aeroelastic tailoring along with active control capability could overcome the stability loss and permit full realization of numerous aerodynamic benefits such as drag reduction, maintainance of zero static margin, store placement at the center of gravity. This effort would investigate all aspects of forward swept wing technology to provide design criteria.

Identify aerodynamic changes resulting from forward sweep. Construct missions which can benefit from these changes. Design airplane sized to meet mission requirements. Compare performance with aft swept baseline.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0025, TACAN/DME DEVELOPMENT

Unknown, Sierra Research Corp., *247 Cayuga Rd., Buffalo, New York* 14225 (FA75WA-3634; FA058611 (TRAIS NO.))

Project includes: 1. The study and analysis of specific and general problems involving TACAN/DME system operations; 2. The design and development of TACAN/DME ground and avionics equipments including modifications thereto; and 3. The evaluation and validation of specific equipments and concepts.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0026, E-3A OMEGA NAVIGATION SUPPORT

P.A. Kossey, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF903950)

The objective of this SPO support is to assess the impact of ionospheric disturbances and propagation anomalies on the E-3A's OMEGA navigation system, and to recommend procedures to minimize their effects upon the system's operational performance.

Data will be taken with a ground monitor system developed by ETEE, during flight tests of the E-3A OMEGA navigation system. This data will be used to aid in the assessment of the capabilities and limitations of the aircraft's OMEGA system. ETEE will provide information on the nature and severity of ionospheric disturbance effects on the propagation of OMEGA navigation signals and will develop techniques/recommendations to minimize those effects on an operational basis.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

1.0027, INVESTIGATION OF AERODYNAMIC CHARACTERISTICS OF WINGS AT SUBSONIC SPEEDS

F.R. Dejarnette, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Mechanics & Aerospace Engineering, *Raleigh, North Carolina* 27607 (NCC 1 13)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0028, COMPUTATIONAL FLUID MECHANICS

H.A. Hassan, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Mechanics & Aerospace Engineering, *Raleigh, North Carolina* 27607 (NCC 1 22)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0029, DESIGN AND ANALYSIS OF ADVANCED STRATEGIC AND TACTICAL MILITARY AIRCRAFT EXHAUST NOZZLE SYSTEMS

D.L. Bowers, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF132000)

The broad problem area of advanced turbojet/turbofan powered military tactical and strategic aircraft is the loss in range and performance attributed to airframe/exhaust nozzle flow interactions. The problems associated with the exhaust system integration have become quite complex for aircraft required to perform efficiently both subsonically and supersonically. The objective of this study is to develop new analytical and design techniques, and to improve available analytical methods that will predict the installed performance of jet exhaust nozzles on advanced strategic and tactical military aircraft.

Improve the calculation of installed exhaust nozzle performance of advanced military strategic and tactical aircraft by improving current and developing new analytical techniques for calculating nozzle internal and external flow fields. Existing experimental data and additional experimental data generated in the AFFDL trisonic gasdynamics facility, AEDC PWT facilities, and NASA facilities will be utilized to develop empirical criteria for exhaust nozzle design.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0030, MECHANICAL INSTRUMENTATION AND TEST ARTICLE DEVELOPMENTS

F.W. Little, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF141550)

The design and performance of advanced military flight vehicles, manned reentry and ballistic missiles can be seriously affected by the aerodynamic characteristics and the flow field surrounding these vehicles. This influence can be validated by testing these vehicles in aerodynamic ground test facilities. The problem is one of precision measurement of such aerodynamic parameters, from these facilities and test models, as force, moment, pressure, temperature and heat transfer rates. This effort is to develop new techniques for model and instrumentation system designs, fabrication and utilization to provide cost effective methods to produce accurate aerodynamic test data. Improved aerodynamic ground test capability will provide for more timely and cost effective development of advanced military flight vehicles and hardware.

Analytical and experimental studies will be made of present techniques to compare and evaluate factors to improve reliability, accuracy and system response. Test model inspection, utilizing a 3-axis measuring machine and computerized data reduction techniques will be further developed to increase data accuracy and reduce the time to obtain the data. Low cost model design and fabrication techniques will be investigated. Specialized instrumentation will be developed for the nine inch advanced transonic wind tunnel test section development program.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0031, ADVANCED DIGITAL CONTROL TECHNIQUES

J.W. McDowell, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF140210)

The transport advanced control synthesis program will investigate applications of modern control techniques to aircraft flight control systems. The objective of this effort is the derivation and implementation of improved flight control laws via restructurable digital systems, thus providing the opportunity for enhanced pilot/crew management of aircraft guidance, navigation and control systems. Performance improvements will be demonstrated which can be applied to military missions of cargo/weapon delivery and aircraft rendezvous. In addition, applied modern control techniques offer the capability for minimization of the effects of atmospheric disturbances, such as wind shear.

Design, fabricate, and flight test validate a digital flight guidance system. Develop the in-house capability to restructure the software and implement flight control laws based upon modern control techniques. Collect flight test data comparing performance of the new control laws. Define applications to future aircraft flight control systems.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0032, X-24B FLIGHT RESEARCH AND PROJECT MANAGEMENT

R.B. Norris, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF135000)

Current Air Force weapon system development activity does not provide for flight research with advanced aerospace vehicles which are designed uniquely for very high speed maneuvering and/or performance. This results in a lack of technical and piloting experience in futuristic vehicle configurations which are capable of transitioning the flight regimes from hypersonic to landing. The X-24B research vehicle is designed to partially fill this void by providing experience with an advanced configuration in the low supersonic to landing flight regimes. The specific objective of this effort is to provide for a continuum of effort on the X-24B program by directing the flight research and project management support to the data gathering and reporting phases of the flight program. Preceding phases, including vehicle modification and flight envelope expansion, have been covered under work unit 14310204.

The data gathering and reporting phases of the X-24B program shall consist of approximately fifteen flights of the X-24B research vehicle during which data instrumental to the development of design criteria shall be gathered. Following the acquisition of the data it shall be reduced, correlated with theoretical and empirical predictions and reported on.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0033, STRAPDOWN GYROSCOPES APPLIED TO LOW COST ATTITUDE HEADING SYSTEMS FOR TACTICAL AIRCRAFT, MISSILES, RPV, ETC

J.M. Perdzock, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF128730)

The Air Force function for the strapped down attitude heading system program supports inertial reference system requirements for all military aircraft. The problems of attitude heading systems (AHS) used in current military vehicles such as the F-4, C-5a, F-111, F-15, etc. are costly, acceleration sensitive, and have marginal reliability. The objective of this effort is to fabricate in-house a body-mounted, strapped down gyro/accelerometer package that can perform as an improved AHS. Demonstration of a strapped down AHS will lead to implementation in DOD aircraft of an AHS with improved performance, increased reliability and maintainability, and lower cost of ownership.

The approach to be used for this in-house effort will be based on using strapdown gyros that are capable of being torqued at a high rate without degradation of performance. Two each, two degree of freedom gyros are to be mechanized with an in-house digital computer that will simulate an all attitude gimbal system. The platform (inertial measuring unit) is to be laboratory tested and finally flight tested for establishing the operational profile of the system.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0034, STRUCTURAL INTEGRITY RESEARCH FOR ENGINES AND AIRFRAMES

G.P. Sendeckyj, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF137380)

Damage accumulation in airframe and engine structures can degrade strength and safety of flight of aerospace vehicles. Knowledge of basic structural behavior is necessary for the development of design and analysis methods for life prediction. Specific investigations will be concerned with fatigue and fracture problems of airframe, engine, and advanced composite structures, strength criteria for laminates, and sensitivity of optimized structural components to initial imperfections. Results will lead to improved structural integrity of military aircraft.

To achieve the many faceted objective, efforts will be undertaken in the following areas - (a) sensitivity of optimized structural components to initial imperfections, (b) failure mode analysis, fracture mechanics, and damage tolerance of composite structures, and (c) development of analysis methods and basic data on load spectrum/environment interaction effects of airframe, engine, and advanced composite components.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0035, DEVELOPMENT OF A PARABOLIZED NAVIER-STOKES SOLVER AND NUMERICAL COORDINATE GENERATOR FOR SUBSONIC AND TRANSONIC PLANE FLOWS

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SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0036, SHIP-INDUCED AIRWAKE TUNNEL TESTS (DD-963)

T.S. Garrett, Boeing Co., *P.O. Box 16858, Philadelphia, Pennsylvania* 19142 (DN881491; N62269-78-C-0097)

To identify hazardous airwake turbulence that will be encountered by V/STOL aircraft landing aboard the DD-963 destroyer. This contract supports work unit ZA601, Agency Accession No DN681080.

A 1/80 scale model of the DD-963 destroyer will be tested in the Boeing Vertol V/STOL wind tunnel. Wind speed, ship heading and roll will be varied. Velocities and pressures will be mapped in selected air spaces lateral to and downstream of the aircraft touch-down point of the flight deck. Three component velocities will be systematically recorded and tabulated along with velocity averages and deviations. A final technical report will be delivered.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0037, THREE DIMENSIONAL FLOW FIELD INSIDE COMPRESSOR ROTOR PASSAGES, INCLUDING BLADE BOUNDARY LAYERS

B. Lakshminarayana, Pennsylvania State University, University Park Campus, School of Engineering, Dept. of Aerospace Engineering, *101 Hammond Bldg., University Park, Pennsylvania* 16802 (NSG 3266)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

1.0038, MARITIME PATROL AIRSHIP STUDY

J.A. Eney, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881665)

To investigate potential application of lighter than air (LTA) vehicles to the current and future requirements of maritime patrol in terms of technical feasibility operational effectiveness and cost.

A system approach will be undertaken to achieve the above objective. Principal areas of the study will be the establishment of mission requirements with associated rationale, the performance of missions analysis including trade-offs and operational effectiveness, the generation of vehicle parametrics, a first order examination of life cycle cost and logistic considerations and a comparison with recent vehicle point designs. Current and near term technology levels will be assumed for structures, materials and propulsion technologies. While current and future applications of LTA vehicles could coincide with historic applications, methods and approaches to performing these and other missions will be addressed with fresh and innovative thinking.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Systems Command, Advanced Systems Concepts Div.

1.0039, ADVANCED COMPOSITE HIGH TEMPERATURE STRUCTURE

T.E. Hess, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN481024)

Analytically synthesize and design an optimal advanced composite primary structural component suitable for the high temperature environment of a high performance vehicle. Assess design alternatives and exploit advantageous properties of boron-aluminum material to meet established design requirements. Provide a basis for in-house prototype fabrication, laboratory evaluation and flight demonstration.

Based on design requirements, potential weight and performance improvements, fabrication complexity and cost, and opportunity for flight demonstration, a primary structural component, the BQM-34E wing, was selected for an analytical design/synthesis effort. Computerized procedures will be used to generate an optimized design, upon which will be based an in-house fabrication and test effort.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0040, MODIFICATION OF A SWARINGEN METRO WIND TUNNEL MODEL

J.C. Brusse, Texas A & M University, College Station Campus, Graduate School, *College Station, Texas* 77843 (NAS 2-10272)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0041, INVESTIGATIONS OF FREESTREAM NOISE IN SUPERSONIC NOZZLES (ABBREV)

J.C. Anyiwo, Hampton Inst., Graduate School, *Hampton, Virginia* 23368 (NAS 1-15877)

Experimental and theoretical investigations of freestream noise in supersonic nozzles and its effects on boundary layer stability and transition.

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0042, INVESTIGATION OF THE EFFECT OF STANDING PRESSURE WAVES ON LAMINATED TRANSITIONAL BOUNDARY LAYER FLOW

R.L. Ash, Old Dominion University, School of Engineering, Dept. of Engineering, *5201 Hampton Blvd., Norfolk, Virginia* 23508 (NSG 1634)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0043, HT RM 78-29 - ASSESSMENT OF MECHANICAL VIBRATION ENVELOPE DETECTION TECHNIQUES

R. Hunthausen, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3816)

Develop, fabricate, test, and evaluate a field operating mechanical vibration monitoring system utilizing the technique of envelope detection. This system will be a field portable device that provides fault isolation and nondestructive inspection (NDI) capability for use on rotating components of helicopter power trains and othr mechanical systems.

The effort will be accomplished under three phases - (1) procurement of two 4-channel envelope detectors to include charge-amp circuitry, selectable band-pass filters, digital display and analog recording capability, (2) development of hardware incorporating bolt-on vibration sensors to be used on helicopter power train components, and (3) evaluation of instrumentation and hardware on operating aircraft by field testing at Ft. Rucker and other Army installations.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0044, HT RM 78-23 - DEVELOPMENT OF AAH SIMULATION MODELS

Unknown, U.S. Dept. of Defense, Army, Aviation Research & Development Command, Applied Technology Lab., *Fort Eustis, Newport News, Virginia* 23604 (DA0E3830)

This effort will develop verified simulation models of the limited production advanced attack helicopter using the aircraft reliability and maintainability simulation (ARMS) model. There would be two models: (1) using design R and M values of the AAH and (2) using mature R and M values of the AAH.

AAH reliability, maintenance, and combat damage elements to the component level will be developed for the three levels of maintenance. Verification and parametric analyses will be performed using the ARMS model to isolate the critical support, reliability, and maintainability elements and identify R and D tasks with potential for enhancing the effectiveness of future Army aircraft.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Research & Technology Lab.

1.0045, NIGHT OPERATIONS METHODOLOGY

H. Ozkaptan, U.S. Dept. of Defense, Army, Office of the Deputy Chief of Staff for Personnel, Org. & Systems Research Lab., *5001 Eisenhower Ave., Alexandria, Virginia* 22333 (DA0B9893)

(1) To determine critical perceptions and alternative procedures for successful performance under conditions of attenuated, marginal and stressful visual and other environments; (2) to develop visual aids and techniques to enhance visual perception at night; (3) to develop navigation techniques to aid the combat infantryman, and the helicopter pilot at NOE altitudes.

(1) A laboratory facility which simulates features of nighttime environments will be utilized. (2) Factors critical to performance in low light environments will be identified in field and laboratory experiments where the number of variables affecting performance will be limited and controlled so that critical factors can be isolated. (3) Performance of military personnel will be evaluated in a number of perceptual and monitoring tasks. Experimental data will include measures of target identification accuracy, obstacle avoidance and navigation.

SUPPORTED BY U.S. Dept. of Defense, Office of the Deputy Chief of Staff for Personnel, Org. & Systems Research Lab.

1.0046, GRADUATE-STUDY RESEARCH PROGRAM IN AERONAUTICS AND AIR TRANSPORTATION SYSTEMS
D.R. Drew, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Industrial Engineering, *Blacksburg, Virginia* 24061 (NCC 1 20)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0047, TEMPERATURE MEASUREMENT IN FATIGUE DAMAGE ANALYSIS
B.I. Sandor, University of Wisconsin, Madison Campus, School of Engineering, Dept. of Engineering Mechanics, *Madison, Wisconsin* 53706 (DF139450; AFOSR-77-3194)

The accuracy of crack life predictions required by USAF Mil-A-83444 depends on the careful characterization of the crack growth damage process. The principal objective of this effort is to experimentally characterize the evolving patterns of plastic deformation that develop in the notch root regions during the course of variable amplitude loading histories. Characterization of the magnitude and extent of the plastic deformation is an essential requirement for structures operating under service loadings. The return on this investment will be an improved structural life prediction capability that comes from an improved understanding of the localized deformation processes that occur in constrained regions.

Fine wire 0.003 inch welded thermocouples will be employed to measure temperature changes of less than 0.1 degrees F in response times of 10 to the minus 4th power seconds in regions local to notches. These temperature changes will be related to the deformation processes that accompany the application of load to the structure. Substantial temperature changes can be measured during the occurrence of plastic deformation induced by static and cyclic loads. Tests will be conducted to define plastic zone sizes/shapes in notched specimens for simple applied load conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0048, PARACHUTE CANOPY STRESS MEASUREMENT
G. Braun, D F V L R, *Cologne, Federal Republic of Germany* (DF140080; AFOSR-77-3261)

Current design practices for textile type canopies used in parachute recovery systems for unmanned and manned flight vehicles incorporate amplification factors to account for dynamic occurrences during the parachute opening process. As a result, parachute canopies are relatively heavy and bulky due to required materials strength, and are subject to failure under overload conditions due to insufficient knowledge for the selection of experience-based amplification factors. The objective of the program is the direct measurement of cloth stresses at selected locations on parachute canopies during free flight for the correlation of the acquired data to analytical predictions and comparison with wind tunnel test results. The resulting data will be normalized for the establishment of design relationships which will aid in the selection of lightweight materials and their effective distribution within the canopy commensurate with the expected stress values. Lighter weight canopies and more reliable performance during the critical phase of parachute operation will result.

Free flight tests of scale model ringslot canopies shall be accomplished utilizing the Braunschweig air pressure cannon test facility. The test canopies shall be instrumental with 'OMEGA' stress transducers, which have undergone static and dynamic calibrations. Measurements during the test will provide data for correlation of canopy stresses, opening force, velocity and instantaneous shape.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, SPACE TRANSPORTATION SYSTEM (STS) GALILEO DNS TECHNICAL SUPPORT
T.A. Schmidt, U.S. Dept. of Defense, Air Force, Weapons Lab., *Kirtland Air Force Base, Albuquerque, New Mexico* 87117 (DF194360)

To provide technical nuclear safety support to HQ USAF and, in particular, the DOD Interagency Nuclear Safety Review Panel (INSRP) coordinator for the formal nuclear safety evaluations of the space transportation system (STS) and the proposed NASA Jupiter Orbiter Probe (JOP) or Galileo spacecraft/mission. IAW AFR 122-15.

This effort will involve many and varied tasks including: technical meeting support, document evaluation, performance of technical studies or analysis, performance independent nuclear safety/risk evaluation of the Galileo mission, which will be presented to the INSRP for consideration and review. An AFWL technical report will not be processed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Weapons Lab.

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, ANALYSIS AND MODELING OF MATERIALS - SPACE ENVIRONMENTAL EFFECTS DATA
J.G. Castle, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics, *Huntsville, Alabama* 35807 (NAS 8-33377)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

3.0002, AN X-RAY DIFFRACTION ANALYSIS OF NE3GE
J.H. Davis, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics, *Huntsville, Alabama* 35807 (NAS 8-33548)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

3.0003, TEST FACILITY FOR HELIUM-3 REFRIGERATOR RESEARCH
J.B. Hendricks, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics, *Huntsville, Alabama* 35807 (NAS 8-33384)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

3.0004, ADVANCED FURNACE DEVELOPMENT AND SCIENTIFIC COORDINATION ACTIVITY
J.B. Hendricks, University of Alabama in Huntsville, School of Science & Engineering, Dept. of Physics, *Huntsville, Alabama* 35807 (NAS 8-33542)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

3.0005, MATERIALS SUPPORT TECHNOLOGY - POLYMERIC THERMISTORS

H. Freiser, University of Arizona, School of Liberal Arts, Dept. of Chemistry, *Tucson, Arizona* 85721 (DN223349; N00014-75-C-0400)

Sensors and detectors are needed by the Navy for a variety of uses such as monitoring atmospheres for contaminants and remote detection of changes in the concentration of species in water and other media. This research concerns ion selective electrodes comprised of polymer coated wires which measure directly the concentration of specific ionic species in air or in water. The purpose of this study is to investigate the nature of these systems in order to improve the sensitivity and selectivity of these detectors.

This work deals with the elucidation of the nature of electrical charge conductivity in filled polymers and electrochemical behavior of polymer coated electrodes and their application to analytical problems. Data will be analyzed in terms of electrode chemical composition vs. response characteristics in order to systematize the development of new kinds of detectors.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0006, MATERIALS SUPPORT TECHNOLOGY - LIQUID DROP IMPACT DAMAGE FOR CERAMIC MATERIALS

W.F. Adler, Effects Technology Inc., *Santa Barbara, California* 93105 (DN675494; N00014-76-C-0744)

The erosion of infrared sensor windows, infrared laser windows, and radomes exposed to rain, ice crystals and airborne dust and debris is a serious problem for all-weather subsonic and supersonic aircraft and missile systems. Investigation of mechanisms of damage in crystalline inorganic materials at impact velocities ranging from 100 to over 1,000 feet per second will be addressed. This will provide rational directions for development of erosion resistant materials via modification of microstructural features.

Work concentrates on damage by water drop impacts on surface defects, influences of bulk material modifications on damage initiation and propagation, and materials removal mechanisms. Materials include single crystal CaF2, MgO, and Si, and polycrystalline CVD ZnS and MgO. They will be impacted with hard solid particles (first three), nylon beads (all), and water (all). Included are static and dynamic indentation resistance, fracture thresholds, surface finish, and microstructure. Interactions of water drops with model defects are to be examined. Fracture mechanics analyses and descriptions of erosion kinetics will be developed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0007, IMPACT OF ALTERNATE FUELS ON AIRCRAFT CONFIGURATION CHARACTERISTICS

D.A. Robinson, Rockwell International Corp., *International Airport, Los Angeles, California* (DF140500; F33615-77-C-3155)

Primary effort in the past has focused on fuel conservation through improving propulsion efficiency, drag reduction and use of different petroleum based fuels. These studies fall under the category of near-term measures. The recent fuel crisis has emphasized the fact that nature's resources are limited. Over half the military energy consumption is in the form of aviation fuel, hence an examination of the use of fuels other than conventional hydrocarbons is needed. Therefore, the objective of this study is to indicate the effects of alternate fuels on aircraft configurations for several typical baseline missions as a first step to identify the most promising alternatives.

The contractor shall conduct an analytical investigation of the impact of alternate fuels on fighter and bomber type aircraft configuration characteristics. Typical missions (air superiority, strategic strike, area intercept) will be used to evaluate performance characteristics of conceptual and modified aircraft designs using the most promising alternate fuels.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

3.0008, HIGH TEMPERATURE MECHANICAL PROPERTIES OF POLYPHASE CERAMICS BASED UPON SILICON NITRIDE

F.F. Lange, Rockwell International Corp., *1049 Camios Dos Rios, Thousand Oaks, California* 91360 (DF048040; F49620-77-C-0072)

AF function - Air Force propulsion systems and missile nosecones require high temperature structural members such as can be provided by the unique properties of ceramics materials. Opportunity - an understanding of high temperature creep and slow crack growth in ceramics will lead to an increase in the safe operational lifetime of this material. Objective - this research will define the interaction of composition and microstructure with creep, slow crack growth and creep rupture so as to control these critical properties. How work contributes - this work will lead to an extended lifetime of high temperature ceramic engines.

High purity silicon nitride will be hot pressed with additives to near theoretical density. The composition and microstructure of the grain boundary phase will be critically examined over a range of heat and stress treatments. Four-point flexural strength, compressional and tensile creep and double-torsional crack-opening-displacements will be performed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0009, ENERGY PARTITIONING AND TRANSFER IN THE H AND HI SYSTEM

J.V. Kasper, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Chemistry, *405 Hilgard Ave., Los Angeles, California* 90024 (DF051930; AFOSR-78-3612)

AF function - operations in communications, reconnaissance and other areas will require lasers with high operating efficiencies and increased power capabilities. Deficiency - there is a lack of highly efficient chemically-pumped lasers in the near infrared-visible region. Objective - this work will attempt to determine the nature of energy partitioning in the reaction H plus HI going to H2 plus I, as well as details of subsequent V-T, R and V-E energy transfer processes. How work contributes - the reaction of H atoms with HI to yield electronically excited I atoms could form the basis for a V-E chemical transfer laser. This study will provide increased understanding of the mechanisms of this potentially important laser candidate system.

Vacuum ultraviolet spectroscopy will be used to determine the initial vibrational distribution of H2 formed in the reaction of HI with H atoms. The affect of H and I atoms on the initial reaction will also be studied. Laser photolysis will be employed to determine the rate of the H plus HI reaction by measuring emission from excited I atoms and monitoring its change in concentration as a function of time. A UV excimer laser will be employed to generate vibrationally excited H2 and study V to E transfer to I atoms.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0010, NAVAL VEHICLE TECHNOLOGY - STRUCTURAL MECHANICS OF COMPOSITES AND BONDED JOINTS FOR NAVAL VEHICLES

P. Mast, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN820013)

Develop more efficient, automated methods for the mechanical characterization of orthotropic and viscoelastic materials such as fiber-reinforced composites and adhesives, and for the design of structural components using these materials. This will permit more effective utilization of those materials and increased reliability in naval structures such as ships, underwater vehicles, missiles, and aircraft.

Develop a large base of experimental data, obtained under complex loads to simulate service conditions, to describe the failure behavior of the material. Develop and apply analytical

techniques to express the data obtained as failure criteria. Integrate these criteria with computer-based structural analysis programs in an automated design process.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

3.0011, MATERIAL SUPPORT TECHNOLOGY - OPTICAL DIAGNOSTICS

J.R. McDonald, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880005)

The objective of this program is the development of new, state-of-the-art optical (laser) techniques for diagnostic applications of importance to the Navy. These applications include combustion analysis, such as gases in jet engines, nuclear reactor off-gas monitoring, and gas laser diagnostics.

Tunable and high power lasers are primary tools for modern diagnostic methods. These techniques include coherent anti-Stokes Raman spectroscopy (CARS) and laser induced electronic fluorescence (LIEF). These methods are useful for species detection, concentration measurement and temperature determination in various combustion applications, such as jet engine combustor and exhaust analyses, detection of radioactive contaminants and gas laser diagnostics. These novel optical techniques are important because they are able to three-dimensionally probe hostile environments where mechanical probes, such as thermocouples, etc. would be consumed, would disturb the system or give erroneous information.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

3.0012, WELDING METALLURGY

E.A. Metzbower, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN780032)

Correlations between properties and structures have been well developed for base metals but are tenuous for weldments. The objective of this task is to correlate the mechanical properties of weldments, especially weld metal and heat affected zone properties, with their structures, i.e., micro- and macrostructures. Such knowledge and data would then serve as a guide in the improvement of existing naval weldments and in the development of future naval weldment systems.

The program is aimed primarily at developing welding parameters for laser weldments of high strength steels, aluminum and titanium alloys, measuring the mechanical properties of these weldments, determining the structures, hardness values and cracking mechanisms, and correlating these data with established laws of physical metallurgy. Such data and correlations that evolve from the program will be compared to known data from more conventional welding processes.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0013, QUANTITATIVE ANALYSIS OF METALLURGICAL SPECIMENS

J.L. Brown, Georgia Inst. of Technology, Graduate School, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NAS 8-33438)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

3.0014, COMBUSTION KINETICS OF SELECTED AROMATIC HYDROCARBONS

R.A. Matula, Louisiana State University, Agricultural & Mechanical College, School of Engineering, Dept. of Mechanical Engineering, *University Station, Baton Rouge, Louisiana* 70803 (DF049360; AFOSR-77-3384)

AF function - all aircraft functions. Deficiency - advanced air-breathing engine technology involving replacement fuels of the future requires much fundamental data on the chemical behavior of such fuels in combustors and exhausts. Objective - this research will study experimentally and analytically the mechanisms and rate constants of high temperature thermal decomposition and oxidation of prototypical hydrocarbon components of alternate fuels. How work contributes - the results of this work will be used to optimize the performance and minimize smoke formation in jet combustors.

Quenched reaction products from a single-pulse shock tube will be analyzed by gas chromatography, mass spectrometry and chemiluminescence. In conventional chemical shock tube experiments, post-shock concentrations will be followed by optical spectroscopy, pressures by transducers, and soot production by adsorption of laser light. Data from both experiments will be combined in an analytical program to obtain mechanisms and rate constants for both quasi-global and elementary pyrolysis and oxidation reactions. Initial priority will be given to toluene, cyclohexane and decalin.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0015, RATIONAL THERMOMECHANICS OF MATERIALS

C.A. Truesdell, Johns Hopkins University, School of Engineering, Dept. of Mechanics & Materials Science, *34th & Charles Sts., Baltimore, Maryland* 21218 (MCS7800396A01)

Continuation of MCS-7621658.

C. Truesdell and associates will continue probing the foundations of continuum mechanics, statistical mechanics and the kinetic theory of gases, with the aim of unifying or at least interconnecting these subjects while obtaining new results in all of them.

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

3.0016, BAND MODEL ANALYSIS OF THE AMMONIA Y4 FUNDAMENTAL ABSORPTION BAND FROM 150-293 K

R.K. Khanna, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Chemistry, *College Park, Maryland* 20742 (NCA 2-420902)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0017, EVALUATION OF ADVANCED GEAR AND BEARING MATERIAL

P.J. Fopiano, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0D4755)

The objective of this program is to investigate the metallurgical properties of gear and bearing materials used in the manufacture of high performance components in army aircraft and ground vehicles. Of particular importance are high speed and high torque (high temperature) applications where current materials have been found to be inadequate. Improvements will be sought in residual life (contributing to enhanced reliability and maintainability) of the components by improvements in the metallurgical structure. Program addresses itself to material technology plans for aircraft (gears and bearings) and MTP for armored vehicles for high Hertzian-stress.

Advanced gear and bearing materials must operate continuously up to ambient temperatures of 450 degrees F. Materials that satisfy this condition fall into the general category of tool steels. This class of steel is inherently less ductile than the alloy steel which is being replaced. Several means for improving this situation include (a) alloy control, (b) ingot control, and (c) thermal and mechanical processing (such as P/M and laser). Two new candidate tool-type steels will be investigated and compared to current comparable steels (VASCO X-2 gear and M-50 bearing steels). Ingot control studies will be continued on ESR VASCO X-2 and AISI 9310 steels. Current P/M and laser processing techniques will be surveyed for possible application to gears and bearings.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0018, ENVIRONMENT - FATIGUE INTERACTIONS IN FIBER REINFORCED COMPOSITES

M.E. Roylance, U.S. Dept. of Defense, Army, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center, *Watertown, Massachusetts* 02172 (DA0F4742)

To assess the influence of an accelerated environment (high temperature, humidity, and ultraviolet radiation components) on the fatigue lifetime of fiber-reinforced polymer composites, to identify material degradation mechanisms, and to optimize the environmental fatigue resistance of these composites for use in dynamic structural elements in Army ground vehicles and aircraft. Special efforts will be directed toward study of effects of moisture on mechanical and dynamic mechanical properties.

Various thermosetting and thermoplastic matrices, reinforced with glass, graphite, and Kevlar fibers, will be fabricated by means of a wide variety of processing methods and subjected to cyclic tension -tension fatigue loads while exposed to an accelerated deteriorative environment. Statistical lifetime distributions will be obtained as a function of mean load, and the data correlated with current theories of cumulative damage and crack growth in composites. Materials deterioration mechanisms will be identified by analytical chemical and microscopy techniques, and processing methods will be developed to eliminate or minimize these mechanisms. Mechanical loss and stiffness, and specimen temperature, will be monitored to develop measures of fatigue damage.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Materials & Mechanics Research Center

3.0019, NAVY VEHICLE DESIGN AND CONSTRUCTION - SINGLE POLYMER COMPOSITES OF HIGH TENSILE MODULI

R.S. Porter, University of Massachusetts, Amherst Campus, School of Engineering, Dept. of Polymer Sciences & Engineering, *Amherst, Massachusetts* 01002 (DN475508; N00014-75-C-0686)

Polymeric materials are used by the Navy in widely varying forms and functions. The properties of such materials are sensitive to the chemical arrangement and physical nature of constituent long chain molecules. This research is aimed at the preparation and characterization of unique composites consisting of radically different morphologies of a single polymer. Such composites hold the promise of high tensile moduli, but low cost for use in aircraft windows, impact resistant materials and noise, shock and vibration absorbers.

Polymers will be prepared in which a sizable content of continuous (extended chain) polymer crystals are suspended in a 'normal' amorphous polymer of identical chemical composition. Such one-polymer systems will avoid the classic composite problem of failure at interfaces since the composition is chemically continuous. Becuase of a high crystal density for chain packing, high density polyethylene will be used in initial preparations of one-polymer composites.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0020, ANALYSIS OF LUBRICANT FILMS IN BEARINGS UNDER INCIPIENT FAILURE CONDITIONS

J.L. Lauer, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Mechanical Engineering Aeronautical Engin & Mech, *110 8th St., Troy, New York* 12181 (DF051060; AFOSR-78-3473)

AF function - propulsion systems for advanced aerospace vehicles require improved lubricants which will withstand a wider range of temperature conditions, greater contact loads and higher shear rates. Deficiency - lubricants continue to fail at elevated temperatures due to complex chemical and physical interactions of the bulk lubricant with its environment and with both static and moving metal surfaces. Objective - understand the bulk and boundary layer chemical-physical properties of lubricants to determine causes of bearing failure. How work contributes - information gained from this research will be used to formulate improved lubricants for AF application that can withstand conditions of extremely high temperatures, pressures and shear rates.

Infrared emission spectra will be obtained through a window in an operating sliding bearing lubricated by a number of standard fluids. A variety of realistic operating conditions will be probed. The spectra will be analyzed for chemical and physical changes in the fluids (e.g. decompositionns, glass transitions), fluid film and metal surface temperatures, and molecular alignment by polarization techniques. Conditions leading to bearing failure will be probed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0021, LIGHT-SCATTERING SPECTROSCOPY OF MULTICOMPONENT FLUID AND POLYMER SYSTEMS

B. Chu, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Chemistry, *Stony Brook, New York* 11790 (CHE7817961)

This grant supports research under the Structural Chemistry and Thermodynamics program for experimental measurement of the properties of fluid and polymer systems at or near critical points. These properties play an important role in nucleation and growth of molecular aggregates, phase formation, phase separation, alloy formation, and polymer structure. There is presently much interest in the static and dynamic properties of multicomponent fluids near tricritical points and Professor Chu will study these in a system containing ammonium sulfate, water, ethanol and benzene using light scattering, small-angle x-ray scattering, neutron scattering, differential refractometry, and rapid pressure variations. Polymer solutions, an area of great practical importance, will form another part of Professor Chu's research program. He will refine and test an analogy between tricritical points and polymer theta points using measurements of light scattering linewidths in polystyrene-cyclohexane solutions.

This research is a continuation of that currently supported by Foundation Grant CHE-7515809.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0022, ANALYTIC MODELING OF SOOT FORMATION UNDER FUEL RICH CONDITIONS

C.H. Yang, State University of New York, Stony Brook Campus, School of Engineering & Applied Science, Dept. of Mechanical Engineering, *Stony Brook, New York* 11794 (NCC 3 2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0023, MOLECULAR BEAM EPITAXIAL GROWTH OF MERCURY CADMIUM TELLURIDE

K.L. Moazed, University of North Carolina, North Carolina State University, School of Engineering, Dept. of Metallurgical Engineering, *Raleigh, North Carolina* 27607 (DF053630; AFOSR-78-3721)

AF function - secure space communication and surveillance and covert optical electronics require devices which exploit the properties and interaction effects of materials with far infrared radiation. Opportunity - infrared materials research has a high potential impact on novel detectors, sources and communications for airborne and spaceborne applications. Objective - more specifically, the objective of this research is to grow various compositions of (Hg, Cd) Te alloys using molecular beam epitaxial techniques in an all glass system designed to insure homogeneous composition over the surface of the substrate. The films will be characterized crystallographically, electrically and optically. How work contributes - the ability to grow large, uniform single crystals of fast, sensitive, narrow-gap semiconductors such as (Hg, Cd) Te economically and reliably would advance AF capabilities in infrared detection and electro-optical surveillance.

In designing the all glass apparatus for crystal growth of (Hg, Cd) Te compounds the major deficiencies of MBE techniques in use currently will be circumvented. These deficiencies are - the relatively low level of vacuum maintained in the system during deposition which affects background contamination, the configuration of the various sources with respect to the substrate and large variations in the source temperature. Suitable precautions

are to be made because of the high vapor pressure of mercury and its ability to contaminate nearly everything it contacts.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0024, NAVY VEHICLE DESIGN AND CONSTRUCTION - FATIGUE OF METAL MATRIX COMPOSITE MATERIALS
M.A. Wright, University of Tennessee, Central Office, Space Inst., Dept. of Metallurgical Engineering, *Tullahoma, Tennessee* 37388 (DN223717; N00014-75-C-0352)

Fatigue is an important factor to consider in many potential Navy composite material applications, such as in components for jet engines and high speed aircraft skins. Thermal fatigue is a result of imposed, varying strains due to the differential thermal expansions of the composite binder and reinforcement as temperature fluctuations occur. Mechanical fatigue occurs due to varying applied loads. In this research both fatigue modes will be investigated in candidate metal matrix composite materials.

Fatigue properties of boron and silicon carbide reinforced aluminum composites will be compared to examine the influence of interfacial bonding on fatigue strength. It is shown that boron bonds better to aluminum than silicon carbide. Measurements and analysis of fatigue in composites of cross-plied boron fibers in aluminum will be completed. For this material the effects of temperature (ambient to 300 degrees C) and gaseous environment (oxygen and water vapor) will be determined. Some tests will be run to determine the degree of degradation of boron/aluminum composites at elevated temperatures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0025, COMPOSITES FOR STRUCTURAL DESIGN
H. Cherry, Texas A & M University, College Station Campus, Graduate School, *College Station, Texas* 77843 (DF051210; F49620-78-C-0034)

AF function - improved aerospace vehicles are possible through the use of advanced composites and associated innovative design concepts. Opportunity - improved understanding of the performance and characterization of advanced composites will enhance Air Force technology applications. Objective - objective of this research effort is to develop a basic understanding between the parameters which characterize advanced composites and composite structural performance. How work contributes - results from the studies undertaken during this program will assist the Air Force in future composite aerospace vehicle development, e.g. AFTI.

Research being conducted under this contract will be pursued along three phases to achieve the stated objective. Parameters which control the mechanical behavior of a laminate will be investigated. Processing characteristics will be studied, such as pressure temperature, hold time rates, etc. in order to quantitatively study residual stress behavior strength, stiffness and fracture characteristics. In addition, diffusion processes will be examined, both theoretically and experimentally, in conjunction with the above, to delineate degradations which occur due to exposure to hostile environments, in particular, elevated temperature and high humidity. Finally, techniques will be examined and developed which have the potential to nondestructively examine laminates in order to a) insure quality, b) characterize defects and c) yield quantitative data on diffusion processes. Neutron radiography will initially be pursued in this approach.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0026, ELECTRON-MICROSCOPIC STUDY OF SAND EROSION PROCESSES IN METALS
J. Zahavi, Technion, Israel Inst. of Metals, *Haifa, Israel* (DF289620; AFOSR-78-3580)

AF function - increased durability of aircraft and engine materials on advanced weapons systems. Deficiency - the erosion of ductile materials by a stream of abrasive particles has been a subject of practical importance in the operation of aircraft engines in sandy or dusty environments. Research - examination of the eroded surfaces with a scanning electron microscope and an electron probe microanalyzer reveals that sand fragments become embedded in the metal surfaces and that the intrinsic erosion process is the result of a sequence of more localized material removal processes occurring when the metal surface is struck by the sand particles. These local erosion processes are characterized by undermining around hard microconstituents and by cratering. The size of the microconstituents (aluminum rich phases in Ti-6Al-4V and iron or copper-rich phases in 2024 Al) about 10 microns is of the same order as the embedded particles and the cratered structure formed. The aim of the proposed research is to gain additional understanding of the mechanism of local material removal from eroded metallic surface by means of direct observation of surface morphology structure and composition in T.E.M., S.E.M. and E.P.M.

This research is expected to find answers to the following: 1) How do the microconstituents affect local erosion processes, i.e., local material removal processes? 2) What is the effect of microconstituents, their size, distribution and composition on the mechanism of local erosion processes? 3) What is the connection between grain size and grain boundaries and local material removal processes? 4) Are there any microstructural changes (dislocation density and distribution, grain size and shape) associated with erosion processes? and 5) Are there any compositional changes (embedded sand fragments into the eroded surface, phase transformation) associated with erosion processes?

SUPPORTED BY U.S. Dept. of Defense, Air Force, European Office of Aerospace Research & Development

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, HEAT TRANSFER AND FLOW CHARACTERISTICS OF EXTENDED SURFACES
G.M. Benson, Energy Research & Generation Inc., *952 57th St., Oakland, California* 94608 (DN875336; N00014-78-C-0271)

Experimental and analytical research will be conducted to determine the thermodynamic and fluid dynamics properties of advanced extended surfaces, including foil fins and reticulated matrices. The latter offers high area-to-volume ratio, minimum resistance to fluid flow, and (predicted) low manufacturing and assembly costs, important characteristics of advanced heat exchangers for ship and aircraft propulsion and auxiliary power applications.

Measurements will be made of temperatures, pressures, and flow rates for ranges of wetted Reynolds number and foil fin and pore densities for air and helium working fluids. Analytical formulations will be made to predict variations of heat transfer and fluid flow resistance.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0002, CONTRIBUTIONS OF SURFACE CATALYSIS AND GAS PHASE KINETICS TO CATALYTIC COMBUSTOR PERFORMANCE
H. Wise, S R I International, *300 Ravenswood Ave., Menlo Park, California* 94025 (DF049840; F49620-77-C-0123)

AF function - advanced air-breathing engines, airborne weapon delivery, and defense. Deficiency - stable, efficient operating range of catalytic monolith combustors is limited by blow-off at high power, extinction at idle. Objective - assess the relative contributions of surface catalysis and gas phase reaction to catalytic combustor performance under various conditions of preheat, fuel-air ratio, and throughput. How work contributes - results will provide additional understanding and realistic analytical modeling of turbulent reactive flow fields associated with high temperature catalytic combustion not now available, contribute to overcoming present difficulties and assist in optimizing catalyst kinetic properties, catalyst geometry in monolith, and flow

parameters for extending the operating range and in improving the stability and efficiency of jet engine catalytic combustors.

Theoretical and experimental studies will be carried out of basic physical and chemical processes of catalytic combustion. The relative contributions of surface catalysis and gas phase reaction in a catalytic combustor will be assessed by developing a detailed computational model for the distributions of velocity, heat and mass (admixed species) in the reactive turbulent flow through a catalytic duct. Measurements will be made of unknown model input parameters. In particular, experimental determinations will be made of the overall global chemical kinetics for catalyzed and gas-phase oxidation of such fuels as propane and JP-4 in air at fuel-lean equivalence ratios over the range of operating temperatures. Verification that the model correctly describes the turbulent transport and its effects on the distribution of reaction will be made in readily observed stagnation point and boundary layer flows over a flat plate, a test section of the plate acting as a sink, instrumented to measure heat transfer to the wall, or as a source, heated externally or by catalyzed reaction for flow probe measurements. The model will then be simplified by identifying local overall kinetic and transport parameters and be applied to identify optimal catalyst location and chemical parameters for stable and efficient duct and monolith combustion.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0003, A COOPERATIVE PROGRAM IN THE COMPUTATION OF TURBULENT FLOWS

W.C. Reynolds, Stanford University, School of Engineering, Dept. of Mechanical Engineering, *Stanford, California* 94305 (NCC 2 15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0004, III-V COMPOUND SEMICONDUCTOR MIS DEVICE TECHNOLOGY FOR MICROWAVE SYSTEM APPLICATIONS

D.L. Lile, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Electronics Engineering & Sciences Dept., *San Diego, California* 92152 (DN587501)

Develop the technology base for semiconducting III-V compound metal-insulator-semiconductor (MIS) devices and circuits. To apply crystal growth procedures and compatible dielectric deposition techniques to the fabrication of III-V compound MIS field effect transistors (FETs) both as single devices and as elements of multi-element arrays and circuits and to evaluate the materials, the devices and their characteristics with regard to their potential applications as microwave and mm wave components. Such devices and technology are expected to have important applications in microwave logic and communications systems.

The basic materials technology for gallium arsenide is available as a result of previous years' work. This and indium phosphide technology is being applied to the development of refined MIS and Schottky gate device structures on both these materials. Such work will require the control of epitaxial semiconductor growth, of dielectric and interface properties and of device technology.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

4.0005, SUB-MICRON JOSEPHSON JUNCTION DETECTOR

G.L. Kerber, U.S. Dept. of Defense, Navy, Naval Ocean Systems Center, Environmental Sciences Dept., *San Diego, California* 92152 (DN887537)

To build Josephson junction detectors that are more sensitive and reliable than existing ones for use in future electronics systems.

The idea of using the edges of thin films to lay down narrow superconducting strips for making the detector junction will be pursued with the expectation of achieving a 0.1 micrometer linear junction dimension. This technique, which uses conventional photolithography as opposed to more exotic electronic beam and x-ray lithography, promises to increase detector sensitivity by 20 db. The technique is particularly suited for the fabrication of sensitive gradiometers as well as interference type (J2) logic elements that will be capable of operation in the 10-20 (degrees) K range which is currently obtainable with small closed cycle refrigerators.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

4.0006, WIND-TUNNEL DETERMINATION OF PARTICLE TO FLUID SPEED FOR SALTATING FLOW

B.R. White, University of California, Davis Campus, School of Engineering, Dept. of Mechanical Engineering, *Davis, California* 95616 (NCA 2-180903)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0007, THE EFFECT OF BOUNDARY CONDITIONS ON FINITE DIFFERENCE SOLUTIONS OF FLUID FLOW PROBLEMS

M. Vinokur, University of Santa Clara, Graduate School, *Santa Clara, California* 95053 (NCC 2 16)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0008, AUTOMATED FLOW SYSTEMS

L.K. Irwin, U.S. Dept. of Commerce, National Bureau of Standards, *Washington, District of Columbia* 20228 (2130462)

PROJECT OBJECTIVE: Develop methods and equipment for automatic testing and calibration of jet engine fuel controls and advise sponsor in implementing automation procedures.

PROJECT APPROACH: Technical assistance advice to the Naval Air Rework Facility, Norfolk, will be improved.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

4.0009, NEUTRINO APPLICATIONS

A.W. Saenz, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880051)

The objective is to determine the feasibility of neutrino communication over global distances, point-to-point, directly through the earth.

The work requires the use of state-of-the-art theoretical methods of high energy and nuclear physics, acoustics, and communication engineering.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0010, SURFACE ACOUSTIC WAVES IN LAYERED MEDIA

J.F. Weller, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680042)

To characterize surface acoustic wave (SAW) propagation in layered media and to demonstrate layered SAW devices; (a) characterize as to power flow direction, velocity, attenuation, dispersion and nonlinear interactions, SAW propagation in selected layered structures; (b) develop mass loaded strip, slot, V/V, and diffused waveguides on piezoelectric substrates; (c) design, fabricate, and parameterize active and passive devices utilizing SAW waveguides; (d) develop beam compression techniques for coupling into SAW guides; (e) generate and characterize new ways of modulating the phase of a SAW in planar and waveguide structures. The Navy has a continuing need for electronic devices which emphasize efficiency, size and versatility. Acoustic surface wave devices appear to be such devices.

SAW devices and structures will be fabricated using sputtered and evaporated amorphous and diffused metal films on piezoelectric substrates. Using microwave and optical probe techniques, SAW propagation characteristics will be determined

for planar and waveguide structures. Various types of SAW waveguides will be characterized with regards to their losses and dispersion. Planar and waveguide devices such as phase-shifters, switches, convolvers, and 3-db couplers will be designed, fabricated, and tested.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0011, BEHAVIOR OF ADVANCED COMPOSITE ISOGRID STRUCTURES

L.W. Rehfield, Georgia Inst. of Technology, School of Engineering, Dept. of Aerospace Engineering, *225 North Ave. N.W., Atlanta, Georgia* 30332 (DF047510; F49620-77-C-0077)

AF function - advanced aerospace flight structures are required which have higher performance and increased durability. Opportunity -advanced composite materials and new manufacturing methods can provide improved performance, lower cost primary structure. Objective -objective of this research is to experimentally examine the behavior of composite isogrid structures and compare data with state-of-the-art theoretical predictions. How work contributes - this research contributes to the Air Force research and development program to exploit the potential of advanced composite primary structure.

Advanced composite isogrid cylindrical shells and wide column structural specimens will experimentally be investigated to determine critical buckling loads, global buckling modes, local buckling modes and assess imperfection sensitivities. Experimental data will be compared with theoretical predictions of buckling behavior in order to assess adequacy of current theoretical approaches. Subsequent to buckling studies experiments are planned to investigate vibrational behavior of the isogrid specimens.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0012, EFFECTS OF AMBIENTS ON MICROELECTRONIC COMPONENTS

M.G. Kovac, Georgia Tech Research Inst., *Atlanta, Georgia* 30332 (DF912490; F30602-78-C-0120)

To establish maximum allowable moisture content for specific military microcircuits.

The investigator will vary the moisture content of 8080 microprocessors to determine both parametric and catastrophic failure thresholds due to moisture. The effects of cracked glass and contaminants will be studied in order to identify the surface- or material-related failure mechanisms. Research will then concentrate on the establishment of the moisture threshold for the specific device under test.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0013, ENVIRONMENTAL DEGRADATION OF STRESSED AND UNSTRESSED SANDWICH PANELS

Unknown, Illinois Inst. of Technology, Graduate School, *3300 S. Federal St., Chicago, Illinois* 60616 (DN781168; N62269-76-C-0237)

To investigate the effect of different environmental exposures on stressed and unstressed sandwich panel construction.

GR/E faced adhesively bonded honeycomb core construction will be exposed to a variety of environments, both in a cumulative and cyclic fashion. This sandwich panel construction will be exposed and placed in a state of stress most simulating actual service conditions on naval aircraft.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

4.0014, OPTIMAL CONTROL OF SYSTEMS WITH UNCERTAINTY

W.E. Schmitendorf, Northwestern University, Chicago Campus, Graduate School, Dept. of Mechanical Engineering, *301 E. Chicago Ave., Chicago, Illinois* 60611 (DF042210; AFOSR-76-2923)

AF function - the design of controllers for AF systems with uncertainties. Deficiency - uncertainties arising from inevitable errors in the mathematical description of a system's accuracy. Objective - the objective of this proposal is to minimize the effects of uncertainty, using as a basis the assumption that nature may select the uncertainties as an adversary attempting to maximize the performance index which the controller is trying to minimize. How work contributes - research results in this area will promote greater confidence in control system operation for systems with uncertainties.

This research is concerned with optimally controlling a system to a specified target when disturbances or uncertainties enter the system. Two questions associated with such problems will be investigated. First, given a target set, determine if there exists a control that assures that the system reaches the target for every possible disturbance. Usually, if there is at least one control which steers the system to the target then there are many such controls. This leads quite naturally to the next problem which is to determine that control which guarantees that the target is reached and is also optimal in the sense of minimizing a specified measure of the system's performance. The purpose of this research is to develop techniques for answering these questions and thereby aid in the design of controllers for systems which may be affected by disturbances or have uncertainties in their mathematical description.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0015, GENERALIZED GEOMETRIC PROGRAMMING WITH APPLICATIONS

E.L. Peterson, Northwestern University, Evanston Campus, Technological Inst., Dept. of Industrial Engineering & Management Science, *633 Clark St., Evanston, Illinois* 60201 (DF046350; AFOSR-77-3134)

AF function - to utilize scarce manpower, funds, and other resources in the most effective manner possible. Deficiency - the best allocation of resources is often an extremely difficult goal to achieve, especially when there is a number of imposed constraints. Such problems arise in structural mechanics, engine/aircraft design, scheduling machine shop jobs, and routing transport vehicles. Objective - to extend the theory of geometric programming, a type of optimization theory that is only 15 years old and which has found a large number of useful applications. How work contributes - research in this area leads to better methods - computationally faster or capable of treating larger problems - which in turn means higher cost effectiveness.

The theory, whose foundations rest largely on the pioneering work of the proposer, will be extended and applied to problem areas of the following sorts - 1) optimal location of new facilities relative to existing facilities, 2) nonlinear multicommodity traffic flow, 3) electric and hydraulic networks, and 4) nonlinear multicommodity storage and/or transshipment.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0016, COMPLEX TURBULENT FLOWS

L.S. Kovasznay, Johns Hopkins University, School of Engineering, Dept. of Mechanics & Materials Science, *34th & Charles Sts., Baltimore, Maryland* 21218 (DF052330; AFOSR-78-3610)

AF function - advanced aerospace vehicles. Deficiency - there is little knowledge of the behavior of the freestream turbulence within interacting flow fields. Objective - develop understanding of turbulent shear flows where two streams with different turbulent structures interact. How work contributes - many real flow problems of interest to the AF involve the interaction of two fluid streams with different turbulence structure. These include - ingestion of freestream turbulence within an external boundary layer, the interaction of exhaust gases with the vehicle wake flow, the mixing of combustion components within a combustion chamber, the entrainment of freestream gases within jet ejectors. An understanding of behavior of these gas streams with different turbulence structures will aid better modeling of transition to turbulence criterion, separation behavior of base flows, noise creation by jet exhausts, decay criterion of wake flows and many other problems of practical interest.

An experimental investigation of the behavior of the large scale structure of axisymmetrical flow streams when different turbulence structures are initially present within the interacting streams will be performed. The results of these interactions will be compared to existing prediction methods and new modeling methods will be proposed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0017, FRAGMENTATION WARHEAD - TERMINAL EFFECTS

J.H. Kineke, U.S. Dept. of Defense, Army, Armament Research & Development Command, Ballistic Research Lab., *Aberdeen Proving Ground, Maryland* 21005 (DA0N4449)

Determine the nature of and quantify the mechanisms pertaining to internal impulsive loading due to hydraulic shock in aircraft fuel containment structures due to multi-fragment impact.

Survey available literature on multiple fragment effects against fluid laden target structures. Observe internal pressure histories at various locations and make high speed photographic observations to provide a qualitative description of fluid flow field formation and interaction. Targets will be generic representations of aircraft wing fuel containment structures in a geometrical sense, but not with regard to structural response characteristics. Assimilate and analyze the experimental data acquired and develop a model for describing the phenomena observed.

SUPPORTED BY U.S. Dept. of Defense, Armament Research & Development Command, Ballistic Research Lab.

4.0018, FLUIDIC EVENT SEQUENCING SUBSYSTEMS (FESS) OF BALLISTIC SYSTEMS

K.L. Englander, U.S. Dept. of Defense, Navy, Naval Ordnance Station, *Indian Head, Maryland* 20640 (DN696206)

To develop the technology and demonstrate the feasibility of (1) utilizing fluidics to obtain longer installed life and improved accuracy and reliability in the sequencing of ballistic systems, and (2) a flueric cartridge initiator (FCI) to obtain a safer and more reliable means of initiating ballistic charges.

This work unit encompasses the development of a fluidic event sequencing subsystem (FESS) which includes the following subassemblies: flueric cartridge initiator (FCI), fluidic sequencer (FS), FCI/FS interface device (ID), and solid propellant gas generator. Flueric cartridge initiator (FCI - Initial feasibility of interfacing the FCI with cartridges employed in escape systems was demonstrated in FY 76/7t. The FY 78 effort involves optimization of the 76/7t FCI configuration. Design feasibility testing (DFT) will be conducted in FY 78 and FY 79. Fluidic sequencer (FS) - The FY 78/79 FS effort will include: (1) demonstration of FS functioning with A and OR - 2-3% accuracy goal over the operational temperature (-65 degrees F to plus 200 degrees F) and supply pressure (plus or minus 15% variation) ranges. Included in the FS will be the vibrating beam oscillator (VBO)/FS counter interface and FS output/interface device (ID; (2) an environmental module will be designed and fabricated to encapsulate all fluidic circuits; (3) the FS/ID/module combination will be tested across the temperature and supply pressure ranges to demonstrate timing accuracy. Interface device (ID) - Design, fabrication, and evaluation of the interface device (ID) and FS output amplification device will be completed in FY 78. FS/ID/module combination tests will be conducted during FY 79. FESS design feasibility testing (DFT). In FY 79, FESS functional testing will be conducted after subjection to the following environments: temperature and humidity (t/h) cycling; sand and dust; salt spray; shock; vibration; 6 foot drop; altitude. Gas generator - Basic performance objectives were met in FY 7t and FY 77 but further optimization to achieve suitable rise time and long-term high temperature storage requirements are being persued. In FY 78 characterization of the propellant will be completed. Gas generator units will be fabricated and design feasibility testing (DFT) conducted in FY 79.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0019, LONG WAVELENGTH PHOTODIODE DEVELOPMENT

D.L. Spears, Massachusetts Inst. of Technology, Graduate School, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NAS 5-25717)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0020, MOLECULAR-ORBITAL STUDIES OF METAL-INSULATOR INTERFACES

K.H. Johnson, Massachusetts Inst. of Technology, School of Engineering, Dept. of Metallurgy & Materials Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NCC 3 1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0021, COMMUNICATIONS - GAS LASER RESEARCH

A. Javan, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN723993; N00014-76-C-0447)

The objective of this work unit is to explore and understand those molecular processes which limit and determine the operation of molecular gas lasers with the goal of enhancing laser efficiency, laser power/energy and wavelength availability. Results of this research program will assist in obtaining an optimum design for molecular lasers which are applicable to Navy requirements for optical reconnaissance, surveillance, communications, guidance, weaponry, fuzing, search and tracking.

Fluorescent emission from high lying electronic states in an excimer excited by a short pulse from a tunable dye laser is used to determine radiative lifetimes, excitation cross sections and quenching rates. High-precision time-resolved measurements are being made of the absorption phenomena and of the growth and decay of the population in the excited states of the rare-gas halides. These measurements are being made as a function of current and gas pressure with several types of rare-gas atoms and molecules. Absolute cross sections will be measured for the rate of production and decay of excited excimers.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0022, IGNITION AND COMBUSTION IN TUBE FLOW WITH HOT TUBE SURFACE

T.B. Shen, Southeastern Massachusetts University, School of Engineering, Dept. of Mechanical Engineering, *North Dartmouth, Massachusetts* 02747 (DF051530; AFOSR-78-3538)

AF function - weapon delivery and defense, transport aircraft fire safety, vulnerability and survivability in accident and combat situations. Deficiency - insufficient understanding of basic physical, chemical and fluid dynamic processes of ignition of combustible fuel-air mixtures by hot surfaces. Objective - to theoretically model the ignition of fuel sprays by hot surfaces. How work contributes - will provide theoretical models not presently available for the ignition by hot surfaces of combustible substances, will improve hazard assessment for both accidental fires and fires caused by combat damage, and in general, contribute to reducing aircraft vulnerability and survivability.

A theoretical model of hot surface ignition of combustible fuel-air mixtures in flat plate boundary layer flow will be modified for tube flow and extended to include both laminar as well as turbulent flows. To perform this analysis, a set of conservation principles in cylindrical coordinates will be treated numerically. Local and instantaneous information about velocity, temperature and concentration variables will be calculated. The instance of the ignition will be identified. The spread of the combustion wave will also be studied. Various integral parameters, such as ignition delay time, the blow-off limit, non-ignition limit, etc., will be deduced. The roles of various control parameters, such as the flow Reynolds number, tube wall temperature, the fuel gas flow rate, the fuel gas initial concentration, gas temperature, fuel type, etc. will be systematically studied. Calculated results will be used to compare experimental measurements and to validate the theoretical model in a follow-on program at AFAPL.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0023, DESIGN AND FABRICATION OF GLIDING DECELERATORS

T. Goodrick, U.S. Dept. of Defense, Army, Natick Research & Development Command, *Natick, Massachusetts* 01760 (DA0H4390)

To achieve a gliding canopy design suitable for large cargo applications.

Several designs are to be studied under contract by wind tunnel and model flight testing. Results are to be analyzed in-house.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0024, APPLICATIONS OF INFORMATION AND SYSTEM THEORY TO AIR FORCE PROBLEMS IN COMMUNICATIONS AND DATA HANDLING

J.K. Wolf, University of Massachusetts, Amherst Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Amherst, Massachusetts* 01002 (DF037370; AFOSR-74-2601)

AF function - to advance the theory and design of high performance communications systems for use in Air Force command and control functions. Deficiency - the subject of coding and decoding is still very young, and there are important cases for which there is a scarcity of practical ways to implement the needed codes. Another area where improvements can be expected is in multiple-user communications systems in which several transmitters are sending to one or more receivers. Objective - this research is aimed toward advancing the theory in three particular problem areas - (1) multiple user channels in which there is no feedback to the transmitters, so there can be no synchronization between transmitters and receivers, (2) the application of information theory to data handling, such as the design of instruction codes in microcomputers, and (3) the construction of coding and decoding algorithms for additive Gaussian channels with or without intersymbol interference. How work contributes - the results of this research could be a significant contribution toward the design of more efficient and flexible communications equipment.

Work will continue in the area of multiple-user communication systems, where it cannot be assumed that the transmitters are synchronized with the receivers. The capacity region for this case will be determined. Another area to be investigated is the decoding of linear block codes, where cyclic codes are used and channel information is available at the receiver. A third important area that will be treated is fault tolerant computers. The plan is to investigate how block coding, which has been used in communications, can be modified to apply to arithmetic codes.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0025, HIGH DENSITY CIRCUITS TECHNOLOGY

T.E. Wade, Mississippi State University, School of Engineering, Dept. of Electrical Engineering, *Suite 101 Engineering Bldg., Mississippi State, Mississippi* 39762 (NAS 8-33448)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

4.0026, THREE-DIMENSIONAL TRANSONIC FLOW ANALYSIS

G.E. Chmielewski, McDonnell Douglas Corp., *P.O. Box 516, St. Louis, Missouri* 63166 (DF043730; F44620-76-C-0096)

Af function - advanced aerospace vehicles. Opportunity - improved flowfield prediction methods in the transonic regime. Objective -develop a computational program which will permit calculation of steady, inviscid transonic flowfields around complex three-dimensional bodies. How contributes - development of this technique will help reduce present requirement for extensive and expensive wind tunnel testing.

A method will be developed for the solution of the transonic full potential equation using the finite difference analog to the governing differential equation. A rectangular computational grid derived from either cartesian or skewed coordinates will be used and complicated global mappings will be avoided. The exact surface boundary conditions will be enforced on embedded curved surfaces using interpolation among surface-adjacent points.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0027, DEVELOPMENT OF A GAS GENERATOR FOR A SUPERSONIC ETE

S. Moskowitz, Curtiss Wright Corp., *1 Rotary Dr., Wood Ridge, New Jersey* 07075 (DN789764; N00140-76-C-0499)

Demonstrate the basis performance and viability of a gas-generator for a supersonic expendable turbine engine.

Fabricate the major engine components, assemble into gas generator and conduct performance tests of the gas generator to assess the soundness of the basic engine design.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

4.0028, LASER TRANSDUCERS

V. Rosati, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Night Vision & Electro Optics Lab., *Fort Monmouth, Red Bank, New Jersey* 07703 (DA0D1972)

The objective of this effort is to develop injection laser transmitters suitable for high data rate operation for communications; to explore solid state devices for input and output of low loss fiber optics including coupling techniques; to characterize electro-optic materials for high speed optical modulators applicable to lasers used in optical high data rate information transfer systems.

The operational characteristics of large optical cavity injection lasers for use in high bit-rate/large duty cycle applications will be explored and transmitters including optical couplers to low loss fiber optics developed. Prototype fiber optic links for high data rate operation of input/output devices will be designed and tested. New electro-optic materials will be characterized, mainly for high speed operation in light modulators.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Night Vision & Electro Optics Lab.

4.0029, FEASIBILITY STUDY TO DETERMINE IF A DUAL POLARIZED L-BAND ANTENNA FOR MW SYSTEMS CAN BE DEVELOPED USING MICROSTRIP AND HONEYCOMB TECHNIQUES

K. Carver, New Mexico State University, Las Cruces Campus, School of Engineering, Dept. of Electrical Engineering, *University Park, Las Cruces, New Mexico* 88003 (NAS 9-95497)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

4.0030, MULTIPLEX INTERIOR COMMUNICATIONS

G. Cotter, Grumman Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN681291; N62269-75-C-0392)

To demonstrate the utility of the GPMs and develop models in accordance with the new DOD multiplexing standard. This contract supports work unit ZC201, Agency Accession No. DN681082

Based on the results of the GPMs-X program, the governing NavAirDevCen specification will be updated to reflect ADM/EDM model equipment for development. With these models the total utility of the GPMs will be demonstrated relative to servicing a total aircraft internal signal capacity.

SUPPORTED BY U.S. Dept. of Defense, Navy

4.0031, OPTICAL BIREFRINGENCE STUDIES OF LATTICE DEFECTS

P. Chaudhari, International Business Machines Corp., *P.O. Box 218, Yorktown Heights, New York* 10598 (DF047790; F49620-77-C-0060)

AF function - solid state microwave devices are essential components of Air Force command and control, communications

and surveillance systems. Deficiency - methods for non-destructive testing of microwave materials are inadequate. Objective - it is the objective of this research to develop methods to evaluate non-destructively bulk and epitaxial microwave materials. How work contributes - this research should provide methods to evaluate large crystals before the costly steps of sectioning them into wafers and polishing the wafers are begun and to evaluate electronic devices after each step during processing.

Birefringence techniques will be developed to determine the location and range of dislocations and to study their origin in bulk and epitaxial microwave materials.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0032, AMTI RADAR CONCEPTS

J.S. Shuster, U.S. Dept. of Defense, Air Force, Rome Air Development Center, *Griffiss Air Force Base, Rome, New York* 13441 (DF902830)

AF function - surveillance. Deficiency - slow moving vehicles cannot be detected in a high clutter environment and large stationary discrete targets cause false alarms in AMTI systems. Objective - to develop radar techniques for long wavelength radars to find slowly moving vehicles in a high clutter environment. Also develop an airborne surveillance radar for finding airborne targets that uses a simple inexpensive phased array antenna system that is fixed with respect to the aircraft. How research contributes - work will provide the base for radar techniques for finding slowly moving targets using long wavelength radars. Arrested synthetic aperture radar (ASAR) in which two synthetic aperture maps formed from separate antennas displaced along the flight path are coherently subtracted, and tuned synthetic aperture radar (TSAR) which uses the difference in the Doppler-Doppler-rate relationship of fixed and moving targets to cancel clutter. A third method, the null filter mobile radar (NFMRAD), which uses antenna nulls complementary to Doppler filters to cancel large discretes is being investigated.

The approach used in all three studies is to first conduct an analytical investigation to determine theoretical radar performance. The second step is computer simulation. The final step is experimental verification. An x-band model radar has been constructed and mounted on a truck which will be used to simulate platform motion. Raw video will be digitized and these concepts will be demonstrated by real-time processing on a digital radar signal processor.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0033, QUANTUM MECHANICAL STUDIES OF MOLECULAR HYPERPOLARIZABILITIES

R.J. Bartlett, Battelle Memorial Inst., *505 King Ave., Columbus, Ohio* 43201 (DF051700; F49620-78-C-0046)

AF function - this is a theoretical investigation in nonlinear optics involving the hyperpolarizabilities of molecular gases. These higher order polarizabilities are an important phenomenon in doubling and tripling schemes used to generate new laser frequencies for Air Force applications. Opportunities - the need to have laser sources at additional wavelengths and to have tunable sources for avionics applications increases the importance of having more fundamental knowledge of nonlinear optics. Objective - investigations directed towards a fundamental understanding of the relation of nonlinear coefficients to microscopic composition and the resonant enhancement of nonlinear processes. Contribution - an important problem in the technological application of nonlinear optics is the improvement of optical frequency conversion efficiency. The investigations of this contract offer potential contributions to this improvement.

This research involves a program of theoretical investigations in nonlinear optics on hyperpolarizabilities, second and third order susceptibilities, of some simple gaseous molecules. Recent developments in molecular quantum mechanics, such as many-body perturbation theory and the development of basic sets geared to polarizability calculations, show promise of providing good results for calculations. Ab initio quantum theoretical methods will be developed to obtain accurate predictions of hyperpolarizabilities of molecules such as H2O, NH3, CHF3 and H2S. The results of these calculations will supply an insight into and prediction capabilities of the processes occurring in frequency doubling laser development.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0034, DETERMINATION OF FATIGUE CHARACTERISTICS OF ION BEAM TEXTURED ORTHOPEDIC IMPLANT ALLOY MP35N IN A PHYSIOLOGICAL SOLUTION

E. Bahniuk, Case Western Reserve University, School of Engineering, Dept. of Biomedical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAS 3-21946)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0035, GRADUATE STUDY PROGRAM IN UNSTEADY HEAT TRANSFER IN TURBOMACHINERY

R.S. Gorla, Cleveland State University, Graduate School, *1983 E. 24th, Cleveland, Ohio* 44115 (NCC 3 3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0036, IDENTIFICATION OF NEW APPLICATIONS FOR ION BEAM TECHNOLOGY

E. Gelerinter, Kent State University, Graduate School, Dept. of Physics, *Hilltop Dr., Kent, Ohio* 44240 (NAS 3-21945)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0037, THE SURFACE CURRENT AND CHARGE DENSITY INDUCED ON FINITE CYLINDER MOUNTED NEAR A PERFECTLY CONDUCTING GROUND PLANE

W.D. Burnside, Ohio State University, Columbus Campus, School of Engineering, Dept. of Electrical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF048710; AFOSR-77-3324)

AF function - geometrical theory of diffraction (GTD) analyses have been used with the principle of reciprocity to analyse the surface current and charge density induced on an aircraft in an electromagnetic environment as for example, the nuclear electromagnetic pulse (EMP). The proposed work will apply the GTE technique to structures near a ground plane. Opportunity - previously developed solutions have been used to compute the surface current and charge density for aircraft in a free space environment, however there is a need for this information when the aircraft is closely coupled with other structures. Specifically the coupling induced by a plane wave incident on a parked aircraft as in an EMP simulator test. Objective - the surface current and charge density induced on a finite cylinder situated above a perfectly conducting ground plane will be analyzed. This solution will be used to determine if large currents or charges are induced due to the open resonator effect, i.e., the finite cylinder and its image. Contribution - this work will provide some basic understanding of the mechanisms associated with closely coupled structures. Two dimensional open resonator problems have been treated in past work which illustrated the applicability of GTD to solve such problems. However, many questions must be answered in the three-dimensional case which will be addressed in this work.

A GTD numerical solution for the surface current and charge density induced on a section of an infinite two-dimensional cylinder near an infinite ground plane. Using a GTD solution the three-dimensional effects associated with a finite strip and circular cylinder situated above an infinite ground plane will be examined. These two solutions will be combined to compute the total surface current and charge density induced on an infinite strip and circular cylinder near a ground plane. The work will be verified using another approach and also by determining if the solution provides the free space result as the cylinder is moved a large distance from the ground plane. An attempt will be made to qualify the resonator effect on the surface current and charge densities.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0038, REACTIVE LOADING ON CYLINDER
P.H. Pathak, Ohio State University, Columbus Campus, School of Engineering, Dept. of Electrical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (DF902530; F19628-77-C-0107)

The objective of this effort is to study propagation characteristics of normal and tangential fields across dielectric surface to enhance strong radiation near horizon circularly polarized. Antenna systems for high speed aircraft missiles and aircraft-to-satellite communications will be improved by the results of this work. Deficiency - a basic problem in the implementation of flush mounted antennas used in aircraft-to-satellite communications is the difficulty of obtaining strong radiation in the end-fire direction in the vicinity of the horizon. This is a major problem and obstacle to further development of full hemispherical scan capabilities of present antenna systems. How research contributes - provide antenna engineers with techniques to design flush mounted antennas capable of hemispherical scan.

The 2-dimensional problem of reactive loading cylinders will be investigated and some new theoretical results applied to realistic variable surface curvature and variable surface impedance cases.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Rome Air Development Center

4.0039, RECONNAISSANCE AND SURVEILLANCE DYNAMIC ANALYZER COMPLEX
R.E. Freeman, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF093540)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0040, MICROELECTRONIC DES/FAB
A.J. Tewksbury, U.S. Dept. of Defense, Air Force, Avionics Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF099500)

Custom thick film microcircuits and custom printed wiring boards will be built in an IH facility. This in-house effort will help reduce the transition time between a technological achievement and prototype system demonstration and at the same time reduce the acquisition costs of prototype hybrid microcircuits and associated interconnections on a printed circuit board. Intimate knowledge of IC microelectronic materials is mandatory. This IH facility will provide a prototype fabrication and test bed for interconnection and packaging concepts applicable to advanced avionic systems. Also contractual achievements and progress in manufacturing technology, exploratory and advanced development areas will be evaluated and assistance given where needed.

The H/PWB facility in thick film and multilayer PWB technologies and in etchback of thin films will be maintained in order to: (1) be a knowledgeable consultant as required, (2) keep aware of the state of the art and discern proprietary techniques from direct applications of materials and standard processing techniques, (3) provide prototypes for functional demonstrations, (4) meaningful direct R and D contractual efforts. Reliable production of hybrid and PWB assemblies suitable for AF systems depends on a set of process-dependent design rules and process controls which must be documented, reviewed and correlated with the desired results. The capability to evaluate processing techniques and process controls in microelectronic interconnection and packaging in hybrid and PWB technologies will be established and maintained. Consultation, technical direction and deliverables evaluation will be accomplished relative to the following programs in the exploratory development and manufacturing technology areas: 1) AFALS 'high density low cost microelectronics packaging', 2) AFMLS 'manufacturing technology for hermetic chip carrier packaging', and 3) AFMLS 'establish improved manufacturing processes for polymide printed circuit boards.'

SUPPORTED BY U.S. Dept. of Defense, Air Force, Avionics Lab.

4.0041, DYNAMICS OF STRUCTURAL CHAIN SYSTEMS
R.L. Huston, University of Cincinnati, School of Engineering, Dept. of Engineering Analysis, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (DN323083; N00014-76-C-0139)

The technical objective of the proposed work is to research and develop a systematic, computer-oriented method for obtaining and solving equations of motion of general chain structural systems of naval interest such as cables, chains, antennas, long flexible booms and aircraft-occupant dynamics. The dynamic equations of motion for such systems are highly non-linear due to the large geometric effects and the structural interactions.

The basic approach is to model mechanical systems (e.g. human-body models, cables, beams, head/neck muscles and vertebrae, antennas, etc.) by a series of rigid bodies connected by springs and/or dampers and/or ball-and-socket joints. Dynamical equations of motion are then written for such systems using basic principles of dynamics (Lagrange's form of d'Alembert's Principle). Computer algorithms are written to generate the coefficients of the governing dynamical equations of motion (coupled, quasi-linear, second order, nonlinear, ordinary differential equations). The equations are then compared with experimental data. The approach is general: that is, it is three-dimensional, three-structure modelling and the connecting springs and dampers may be nonlinear thus simulating elastic and viscoelastic effects.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0042, GRADIOMETER PROBE ASSEMBLY
Unknown, Hahnemann Medical College & Hospital, Graduate School, *Philadelphia, Pennsylvania* 19102 (NAS 2-10313)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

4.0043, REMOTE OPTICAL SENSING OF OCEAN UPPER LAYER TEMPERATURE
K. Petri, U.S. Dept. of Defense, Navy, Naval Air Development Center, Sensors & Avionics Tech Directorate, *Warminster, Pennsylvania* 18974 (DN881009)

To investigate the feasibility of measuring ocean surface and subsurface temperatures remotely with a laser radar. An airborne laser radar that could remotely sense ocean temperatures would be used to plot maps of ocean temperatures. Variations in ocean temperatures are important in predicting acoustic data propagation for ASW applications. Prediction in ocean waves from measurement of surface temperature could improve fleet operations without the need for BT and XBT measurements.

A laser radar including Raman shift techniques for sensing temperatures remotely will be developed under contract. Previous programs have demonstrated feasibility in a laboratory environment. The laser radar will be suitable for installation in a P-3C aircraft for flight test evaluation.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Systems Command, Surveillance Admin.

4.0044, TO INVESTIGATE PROBLEMS OF SIMULATION AND CONTROL OF MECHANICAL SYSTEMS IN RELATION TO AEROSPACE VEHICLES
Unknown, Clemson University, Graduate School, *Tillman Hall, Clemson, South Carolina* 29631 (NCA 1-24)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0045, THEMATIC MAPPER SIMULATOR - IMPROVED CAPABILITIES OVER SPACECRAFT (MMS) FOR ARID AND SEMI-ARID RANGE LAND REMOTE SENSING (ABBREV)
R.H. Hass, Texas A & M University, College Station Campus, Agricultural Experiment Station, *College Station, Texas* 77843 (NAS 5-25715)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0046, DESIGN OF AEROSPACE SYSTEMS WITH INCLUSION OF HUMAN RESOURCE FACTORS USING A DESIGN MORPHOLOGY

B. Ostrofsky, University of Houston, School of Engineering, Dept. of Industrial & Systems Engineering, *3801 Cullen Blvd., Houston, Texas* 77004 (DF049600; F49620-77-C-0116)

AF function - the system engineering/systems management procedures developed by the Air Force during the 1960's identified the philosophy and the details and implementation for Air Force systems. This documentation identified reporting details for each activity during the system life cycle and, while it left the designer free to improvise, it constrained his activities to definable and reportable categories. An improved rationale for the design of technological systems is required. Deficiency - the effects of changes or retrofits in the long-term development and acquisition of expensive, advanced technological systems must be anticipated more accurately to help eliminate significant cost overruns. Objective - the research proposed will define a decision structure required to use resources optimally in attempting to meet design objectives. How research contributes - the research resulting from this effort is intended to clarify the decision structure and methodology for the design of high technology, large scale Air Force systems with emphasis on integration of human resources factors and metrics.

The design morphology will be applied to a moderate sized USAF system inasmuch as feasibility of the methods were demonstrated on a relatively simple mechanical system and effectiveness of application on a larger system remains to be determined. Feasibility steps will be accomplished by identifying problem requirements, accomplishing the input-output matrix, synthesizing solutions, and screening them. Emphasis on the role of human factors will be achieved by thorough study of the environment anticipated for the production, deployment, operations, and retirement phases. The definition of the criteria, submodels, and design parameters will be accomplished formally with human factors imbedded in the analysis for proper study with the physical and technical constituents of the design problem. Analytical relationships between the set criteria and the parameters will be accomplished. The multiple criteria will be synthesized and the range of each set of criteria will be determined from the limits imposed on the parameters. An assessment of the completeness and effectiveness of human factor inclusion in the Air Force design environment will be made.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0047, AUTONOMOUS SATELLITE NAVIGATION METHODS USING THE GLOBAL POSITIONING SATELLITE SYSTEM

Unknown, University of Texas, Austin Campus, Graduate School, *200 W. 21st, Austin, Texas* 78712 (NAS 5-25756)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

4.0048, NEW NONLINEAR OPTICAL PROCESSES IN MOLECULES AT INFRARED FREQUENCIES

M.F. Becker, University of Texas, Austin Campus, School of Engineering, Dept. of Electrical Engineering, *200 W. 21st, Austin, Texas* 78712 (DF053350; AFOSR-78-3712)

AF function - various nonlinear optical techniques are promising to meet needs for coherent light sources. This research program represents a study of two relatively new types of optical nonlinearity which appear in molecules at infrared frequencies. The first nonlinearity may be characterized as 'hybrid,' in that its nonlinear susceptibility is governed by a near resonant vibrational energy level and off resonant electronic energy levels. The second type of nonlinearity is purely 'vibrational' and its susceptibility is determined solely by combinations of resonant and near resonant vibrational-rotational energy levels. Opportunity - properties of nonlinearities will be studied through third harmonic generations. This effort should help eliminate some of the discrepancies between theory and experiment on nonlinearity of gases. Objective - this work will involve a study of the properties of nonlinear gases through third harmonic generation. A theoretical effort will be undertaken to improve the theoretical experimental agreement on predicted conversion efficiences. Contribution - the most important problem in the technological application of nonlinear optics is the improvement of optical frequency conversion. The investigations of this grant offer potential contributions to this improvement.

This research program represents a study of two relatively new types of optical nonlinearity which appear in molecules at infrared frequencies. The experiments proposed herein are motivated by previous study of third harmonic generation in SF6 and 10.6 microns. The nonlinear susceptibiity for these two new nonlinearities is determined primarily by one or more nearly resonant vibrational energy levels. These resonantly enhanced nonlinearities will provide third hamonic generation and four photon sum and difference frequency generation in the infrared. The properties of these nonlinearities will be studied through third harmonic generation experiments. An experimentally correct, predictive model for the interaction will be developed to understand the nature of the limiting processes which may affect conversion efficiencies at higher power densities.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

4.0049, SUMMER STUDENT TRAINING PROGRAM WITH HAMPTON INSTITUTE

L.H. Slaughter, Hampton Inst., Graduate School, *Hampton, Virginia* 23368 (NCA 1-25)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0050, VAPORIZATION OF DROPLETS IN PREMIXING CHAMBERS

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SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, SIMULATED MARTIAN AEOLIAN EROSION AND AGGREGATE FORMATION

D. Krinsley, Arizona State University, School of Liberal Arts, Dept. of Geology, *Tempe, Arizona* 85281 (NCA 2-35902)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0002, THEORETICAL INVESTIGATION OF THE MECHANICS OF STRIKE SLIP FAULTING IN AN ANELASTIC EARTH

H.J. Melosh, California Inst. of Technology, Graduate School, Dept. of Planetary Sciences, *1201 E. California Blvd., Pasadena, California* 91109 (NCC 5 17)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0003, AN INVESTIGATION OF THE USES OF DIGITALLY MOSAICKED LANDSAT AND TERRAIN DATA FOR WILDLAND RESOURCE MANAGEMENT IN MENDOCINO COUNTY, CALIFORNIA

R.N. Colwell, University of California, Berkeley Campus, School of Natural Resources, Dept. of Forestry & Conservation, *Berkeley, California* 94720 (NCA 2-50903)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0004, JOINT TRAINING COURSES FOR EDUCATORS
J.E. Estes, University of California, Santa Barbara Campus, School of Letters & Science, Dept. of Geography, *Santa Barbara, California* 93106 (NCA 2-680903)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0005, PROCESSING OF LANDSAT DATA FOR CHANGE DETECTION RESEARCH
Unknown, Colorado State University, Graduate School, *Fort Collins, Colorado* 80523 (NAS 5-25696)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

5.0006, COASTAL ZONE COLOR SCANNER STUDIES
E.T. Baker, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (87134679)

PROJECT OBJECTIVE: To provide sea-truth validation studies for the coastal zone color scanner on the Nimbus-G Satellite.

CURRENT YEAR PLAN: Investigators will participate in three cruises designed to sample various water types in conjunction with satellite overpasses. Cruises will be in the Gulf of Mexico, off southern California, and in the Gulf of Maine.

PROGRESS REPORT: Participated in 1978 Gulf of Mexico CZSC experiment with several other investigators from Nimbus-G experiment team. The experiment was designed to test the CZCS equipment aboard an airplane while shipboard ocean water observations were made simultaneously.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0007, A RESEARCH PROGRAM IN ATMOSPHERIC SCIENCE
H. Liebowitz, George Washington University, School of Engineering & Applied Sciences, *725 23rd St. N.W., Washington, District of Columbia* 20037 (NCC 1 19)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0008, ELECTROOPTICS METEOROLOGY (METEOROLOGICAL SUPPORT SYSTEMS)
H.E. Gerber, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN639124)

Improve the operational capability of the Navy in its function of assessing the state of the marine boundary layer to support such strategic and tactical systems which are vulnerable in their performance to clouds, aerosol, water vapor and turbulence. Provide instruments and methods to establish useful climatologies, to give real-time support and to develop forecast capabilities on electro-optics transmission parameters.

Exploratory instrument development is applied to further the understanding of the relationship between marine aerosol and meteorological parameters and the electrooptics transmission parameters which are required for optimizing the utilization of specific Navy EO systems. The present effort includes the exploratory development of a portable transmission trend in a fog environment.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0009, ENVIRONMENTAL ASSESSMENT
J.M. Goodman, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680316)

The objective of this work unit is to collect and analyze solar electromagnetic and corpuscular data from terrestrial systems and space systems such as SOLRAD HI, GOES and HAWKEYE with a view toward developing an association between solar observables and various effects of importance to Navy systems. Ultimately this research will lead to either new or improved ionospheric forecasting capability. This capability will, in turn, lead to exploitation potential. The development of associations will be made as quantitative as possible with the determination of algorithms given priority attention.

Solar electromagnetic and corpuscular data will be obtained and processed at the Space Environment Data Analysis Center (SEDAC) at NRL. A principal component will be provided by SOLRAD HI whose data is transmitted in real-time to the SEDAC. Geophysical data is transmitted to the SEDAC over teletype (ATN) and the NOAA SELDADs data base is accessed in the backup mode.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

5.0010, DYNAMIC IONOSPHERIC MODELING
D. Strobel, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN220016)

Develop two- and three-dimensional models of the laminar ionosphere which will accept data from SOLRAD and other sensors. The object is to provide the information needed to predict the ionospheric effects on ionospherically propagated systems.

Multi-dimensional reactive flow MHD computer codes that solve the equations of motion of a chemically reactive compressible fluid in a magnetic field will be used to study the response of the ionosphere to the deposition of solar radiation. New data on the composition of the ionosphere will be incorporated, and its influence evaluated. A global model with transient effects will be developed, with the appropriate chemistry incorporated.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

5.0011, NAVY ENVIRONMENT - THE INTERACTIONS AMONG SURFACE WATER WAVES AND WITH INTERNAL WAVES AND ELECTROMAGNETIC WAVES
J.W. Wright, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN580066)

The major purpose of this effort is to determine the dependence of short gravity wave and capillary wave amplitudes on windspeed, currents, surfactants, air-water temperature difference and to develop theories in conjunction with the measurements which will yield quantitative descriptions of the fine structure of the air-sea interface. Such knowledge is necessary for a variety of naval applications including surveillance of the surface weather over the oceans from satellite and OTH radars for ship routing, especially hydrofoils, to non-acoustic anti-submarine warfare.

Microwave scattering techniques at frequencies of 1-70 gHz, and photometric methods are used to measure phase speeds and temporal and spatial wave growth rates in wavetanks. Modulation transfer functions governing wave contrast in radar imagery are measured on the ocean, as well as in wavetanks at 1-35 gHz as a function of windspeed, wave amplitude and water depth. Wave-wave and wind-wave interactions are calculated and compared with experiment.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

5.0012, THREE-DIMENSIONAL SIMULATION OF THE JOVIAN CIRCULATION
F.N. Alyea, Georgia Inst. of Technology, Graduate School, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NCC 2 9)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

5.0013, LANDSAT TECHNOLOGY TO ASSESS THE STRUCTURE AND POTENTIAL WASTE DISPOSAL CAPA-

BILITY OF WETLANDS ALONG SAVANNAH RIVER (ABBREV)
J.L. Cooley, University of Georgia, Graduate School, *Athens, Georgia* 30601 (NAS13-121)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0014, CONDUCT SHORT COURSES IN REMOTE SENSING
Unknown, University of Georgia, Graduate School, *Athens, Georgia* 30601 (NAS13-125)

SUPPORTED BY U.S. National Aeronautics & Space Admin., National Space Technology Lab.

5.0015, SIDE LOOKING AIRBORNE RADAR & SIMULATED THEMATIC MAPPER MULTI-SPECTRAL DATA FOR FOREST COVER MAPPING USING COMPUTER AIDED ANALYSIS TECHNIQUES
R.M. Hoffer, Purdue University, School of Agriculture, Dept. of Forestry & Natural Resources, *Life Sciences Bldg., West Lafayette, Indiana* 47907 (NAS 9-15889)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

5.0016, LITHOSPHERIC MODELS OF THE NORTH AMERICAN CONTINENT DERIVED FROM SEISMIC REFRACTION AND SURFACE WAVE STUDIES
L.W. Braile, Purdue University, School of Science, Dept. of Geosciences, *Executive Bldg., West Lafayette, Indiana* 47907 (NCC 5 21)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0017, DATA REDUCTION ANALYSIS FOR MEASUREMENT OF LOW ENERGY ELECTRONS AND PROTONS IN THE EARTH'S MAGNETOSPHERE
L.A. Frank, University of Iowa, School of Liberal Arts, Dept. of Physics & Astronomy, *Jessup Hall, Iowa City, Iowa* 52240 (NAS 5-25530)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

5.0018, MSFC SOLAR HEATING AND COOLING HIGH SPEED PERFORMANCE (HISPER) CODE VALIDATION
H. Healy, Western Kentucky University, School of Science & Technology, Dept. of Engineering Technology, *Bowling Green, Kentucky* 42101 (NAS 8-33387)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

5.0019, RESEARCH OF THERMAL REGIME OF THE UPPER MANTLE
B.D. Marsh, Johns Hopkins University, School of Arts & Sciences, Dept. of Earth & Planetary Sciences, *34th & Charles Sts., Baltimore, Maryland* 21218 (NCC 5 18)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0020, QUANTITATIVE EVALUATION OF LAND USE AND NATURAL RESOURCES IN THE RHODE RIVER WATERSHED
D. Higman, Smithsonian Institution, Chesapeake Bay Center for Environmental Studies, *Rural Rte. 4 Box 622, Edgewater, Maryland* 21037

Objectives remain as previously stated: 1. To delimit and map the sub-watersheds of tributaries to Rhode River, and to quantify the areas in each with respect to types of land use. 2. To apply Objective 1 to the years 1938, 1949, 1957, and 1972 in order to depict changes in land use throughout the Rhode River watershed between these years.

PROGRESS: The Rhode River watershed was divided topographically into 21 drainage areas, 12 of which are basins of tributaries. Images of natural color (for 1972) and black/white (for 1957) aerial photographs were projected onto the map of each sub-watershed and corrected for distortion, using a Bausch & Lomb Zoom Transfer Scope. The pattern of land use in each sub-watershed was then drawn onto the map and all definable areas numbered. Sixteen types of land use or condition were defined by photo-interpretation (forest in 3 size classes, cropland, pasture/hay, other grassland, overgrown field, bare soil, residential, commercial, institutional, paved, open water, fresh marsh/swamp, salt marsh, and beach). Buildings were counted and classified as domestic, farm, and other (commercial/institutional).

STATUS IN FY 1977: The sub-watershed land use maps and associated data for the years 1957 and 1972 have been included in a mimeographed report ('Environmental Monitoring and Baseline Data, 1973, Temperate Studies, Section II') compiled under the Smithsonian Institution Environmental Sciences Program.

SUPPORTED BY Smithsonian Institution, Office of Fellowships & Grants

5.0021, MEASUREMENT OF COMPOUNDS IN THE STRATOSPHERE OF THE EARTH AND THE DEVELOPMENT OF MEASUREMENT TECHNIQUES
Unknown, Harvard University, Cambridge Campus, Graduate School, *Cambridge Station, Cambridge, Massachusetts* 02138 (NASW 3242)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

5.0022, EXTENDED FIELD SPECKLE IMAGE RECONSTRUCTION OF SOLAR FEATURES
R.W. Noyes, Harvard University, Cambridge Campus, School of Arts & Sciences, Dept. of Astronomy, *Cambridge Station, Cambridge, Massachusetts* 02138 (DF580050; F19628-78-C-0026)

AF function - communications, surveillance, detection, tracking. Deficiency - inability to routinely observe high angular resolution detail on the solar surface. Objective - to apply newly developed techniques for reconstruction images free from atmospheric distortion to studies of the solar surface. How research contributes - enables Air Force monitoring capability on solar surface disturbances to be increased by a factor of ten in resolution on a routine basis.

Techniques are to be developed to apply the newly developed method known as 'speckle interferometry' to the reconstruction of images free from atmospheric distortion for extended objects like the solar disk. These methods will be applied to the study of the evolution and structure of features such as solar convective cells. Results will be the first systematic high resolution studies of magnetic and convective evolution.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0023, THE LONGITUDINAL VARIABILITY OF EQUATOR SCINTILLATIONS DETERMINED FROM AIRBORNE MEASUREMENTS
J. Buchau, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580940)

AF function - communication through the disturbed ionosphere and AFSATCOM. Deficiency - prediction and real time specification of ionospheric disturbances degrading VHF, UHF and SHF satellite communications. Objective - to investigate the formation, structure and dynamics of equatorial F-layer irregularities, their longitudinal and temporal variability and their effects on satellite communications. How research contributes - payoff is through better predictability of scintillation effects on satellite communications on a global scale and through improved design and operation of satellite communication systems. These improvements are in terms of defining bandwidth and power

requirements, modulation techniques, system reliability assessment and operational procedures.

The airborne ionospheric laboratory equipped to receive VHF and UHF satellite transmissions and instrumented for ionosphere and airglow studies will conduct satellite-to-aircraft VHF/UHF scintillation measurements simultaneously on up to four frequencies during a special equatorial campaign. These measurements will be made on coordinated transmissions from the LES 8 and LES 9 satellites (250 mHz) and beacon transmissions from the DNA-002 beacon satellite (137 and 378 mHz). The campaign will be coordinated with ground experiments carried out under task 464305 ionospheric scintillation effects. All sky photometer observations, spectrometer and photometer measurements, and ionospheric soundings will be carried out during the satellite signal reception and will permit one to assess the relation of the observed scintillations to the geophysical conditions encountered. The satellite field strength data will be analyzed in terms of amplitude and spectral distribution as well as in terms of the fading rate dependence on aircraft heading. The comparison of measurements at various longitudes will provide information on the longitudinal variability of the equatorial scintillations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0024, CLOUD ANALYSES FROM DMSP IMAGERY

J.T. Bunting, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581490)

AF function - weather observing, analysis and forecasting for military operations. Deficiency - lack of adequate information to meet military weather support requirements. Objectives - to evaluate methods for estimating cloud information from satellite imagery and to develop an improved data processing plan for use in the AFGWC 3-dimensional NEPH-analysis. How development contributes - makes possible the real-time use of high-resolution satellite imagery in operational analysis and forecasting to satisfy requirements of AWS TN 2-75.

Under IHWU 86281202 (terminated for administrative purposes) several interrelated techniques were identified which offer potential improvement in extracting cloud information from high resolution satellite imagery. These techniques will be developed in order that improved automated processing procedures can be presented to AFGWC for use in the 3-dimensional NEPH-analysis program. These techniques include discrimination of cloud type based on Fourier analyses, bit-reduction algorithms to compress images to reduce computer requirements and application of multispectral data to obtain information on cloud structure, cloud phase and precipitation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0025, SATELLITE DENSITY MEASUREMENTS USING IONIZATION GAUGE INSTRUMENTATION

J.P. McIsaac, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF581200)

AF function - low altitude, operational satellites, airborne surveillance, ballistic nuclear weapon delivery. Deficiency -inaccuracies in the determination of low altitude satellite ephemerides due to inadequate data on density variation at critical altitudes. Objective - acquisition of atmospheric density measurements on a global scale, to define, correlate and/or relate results empirically with solar and geophysical phenomena. How research contributes - permits direct accurate measurements of density providing inputs to be used in the development and upgrading of forecasting techniques.

Ionization gauge instrumentation will be flown onboard the S77-2 spacecraft providing measurements of atmospheric neutral density during the 1978 calendar year, a year in which solar activity is on the increase approaching its maximum peak period. Instrumentation using ionization gauges also include a motor activated air stream modulator. These S77-2 flight units are capable of direct measurement of atmospheric gas density but will also be flight tested for potential applications as atmospheric gas temperature monitors. Data acquired in this flight will be utilized and merged with the S3 satellite density data base for use in empirical studies as well as analysis and correlation investigations of a statistical nature.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0026, ARIES ROCKET FLIGHT ENVIRONMENT

R.G. Steeves, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF249750)

AF function - probing the aerospace environment. Deficiency or opportunity - the ARIES flight environment is largely unknown. Objective - gather in-flight environmental data for ARIES rocket payloads. How research contributes - provides data on boost and post-boost phase of flight to set environmental design, testing, and operating standards for scientific instrumentation to be flown on ARIES.

A system will be designed and assembled independent of other rocket instrumentation to measure in-flight vibration and temperature data. Data gathered from a minimum of 3 vibration transducers will be analyzed after each of three flights. Critical temperatures will be measured and telemetered.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0027, MOBILE AEROSOL LABORATORY INSTALLATION AND TESTING

F.E. Volz, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF580250)

AF function - target acquisition and tracking reconnaissance. Deficiency - the performance of optical systems observing through the atmosphere is significantly degraded by absorption and scattering by aerosol particles. Research - assembly and testing of instrumentation for a mobile laboratory to measure aerosol optical properties by spectroscopy of high volume aerosol samples, aerosol size distribution and aerosol forward scatter. How research contributes - create capability for aerosol field measurements and monitoring of concentration and size distribution of aerosols. This will enable calculation of visual and IR aerosol extinction and scattering.

Modify existing van and install two laser aerosol size spectrometers with electronic data processing equipment. Also, install high volume aerosol sampler. Prepare description of capabilities of the mobile aerosol lab and report test results. Investigate the effect of absorbing aerosols on spectrometer performance. Mobile aerosol lab will be available for special deployment to AF field tests requiring aerosol data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0028, LOW ENERGY PLASMA MOTION

P.J. Wildman, U.S. Dept. of Defense, Air Force, Geophysics Lab., *L.G. Hanscom Field, Bedford, Massachusetts* 01731 (DF248940)

AF function - FY77 - communication, surveillance, navigation and ionospheric modeling. Deficiency - inadequate knowledge of bulk motion of ionospheric and magnetospheric plasma inhibits prediction of ionospheric irregularities and density gradients. Objective - use plasma bulk measurements to improve modeling of ionospheric dynamics at all latitude . Develop improved instrumentation. How research contributes -permits prediction of mid-latitude trough and plasma morphology at high latitudes.

Data for PHR experiments on s3 series satellites will be analyzed to determine plasma bulk motions, and their variation with geophysical parameters. Criteria for improving instrumentation will be developed during the examination of the experiment data.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0029, SOLAR ATMOSPHERIC DYNAMICS

R.F. Stein, Michigan State University, School of Natural Sciences, Dept. of Astronomy & Astrophysics, *243 Natural Resources Bldg., East Lansing, Michigan* 48824 (DF248840; F19628-77-C-0068)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions.

Objective-to determine the energy transport mechanisms operating that heat the solar corona and drive the solar wind. How research contributes - provides information on which solar functions, such as oscillations, give rise to coronal and solar wind flows.

Calculate the driving of the solar atmospheric (300 second) oscillation resulting from thermal overstability of acoustic and magnetic modes in the super-adiabatic convection zone and the propagation, refraction and dissipation of these oscillations in the solar cozona. Such results can then be used to determine what photospheric oscillation configurations give rise to the solar wind.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

5.0030, DESIGN, FABRICATE, TEST AND DELIVER ONE STATIC DIFFUSER CHAMBER
Unknown, University of Nevada, Reno Campus, Graduate School, *Reno, Nevada* 89507 (NAS 8-33295)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

5.0031, PROPERTIES OF SNOW AND ICE
A. Gow, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (DA0M8144)

To provide information on properties of snow and ice in support of the development of techniques to maintain a line of communication network in a winter heater operation. Certain fundamental information on the properties of snow and ice is necessary for expedient terrain modification and construction in winter or extremely cold environments.

The required information is being generated through a coordinated sequence of investigations. The physical properties of snow and ice involving thermal, mechanical and mass transport processes are emphasized to provide information required for the solution to Army problems concerning (1) expedient construction of roads, airfields, helipads and ice crossings; (2) bridge erection over frozen and jammed rivers; and (3) artificial creation of ice jams, snow slides, snow swamps, etc. Special attention is given to investigations of the structural and physical properties of snow and ice covers, mechanical response of ice covers to complicated loads, and the results of phase changes on the physical properties and response of snow and ice.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

5.0032, TACTICAL WEATHER INTELLIGENCE HELICOPTER ICING PREDICTION
H.W. Maynard, U.S. Dept. of Defense, Army, Electronics Research & Development Command, Atmospheric Sciences Lab., *White Sands M.R., Las Cruces, New Mexico* 88002 (DA0F2124)

To provide Army aviators with operational techniques for estimating the danger of helicopter icing.

The approach is incremental: 1. Diagnose presence of clouds with temperatures below freezing. 2. Predict presence of clouds with temperatures below freezing. 3. Determine physical and thermodynamic conditions within clouds conducive to helicopter icing. 4. Incorporate the above results into a time-dependent helicopter icing model. 5. Validate the model.

SUPPORTED BY U.S. Dept. of Defense, Electronics Research & Development Command, Atmospheric Sciences Lab.

5.0033, RESEARCH OF THE RELATIONSHIP BETWEEN GRAVITY AND BATHYMETRY IN THE PACIFIC OCEAN
A.B. Watts, Columbia University, Lamont Doherty Geological Observatory, *Palisades, New York* 10964 (NCC 5 3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0034, MULTIDISCIPLINARY RESEARCH IN SPACE SCIENCE
W.S. Broecker, Columbia University, School of Engineering & Applied Science, Dept. of Geology, *Broadway & W. 116th St., New York, New York* 10027 (NCC 5 16)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0035, RESEARCH OF PRECISE LEVELING, SPACE GEODESY AND GEODYNAMICS
J. Oliver, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Geological Sciences, *Ithaca, New York* 14850 (NCC 5 4)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0036, SURVEY AND ASSESSMENT OF EXISTING OPTICAL INSTRUMENTS APPLICABLE TO CHEMICAL RELEASE OBSERVATIONS
E.R. Manring, University of North Carolina, North Carolina State University, Graduate School, Dept. of Physics, *Raleigh, North Carolina* 27607 (NAS 5-25751)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0037, DEVELOPMENT AND EVALUATION OF REMOTE SENSING TECHNIQUES FOR SOIL SURVEYS
G.W. Petersen, Pennsylvania State University, University Park Campus, Agricultural Experiment Station, Dept. of Agronomy, *201 Shields Bldg., University Park, Pennsylvania* 16802 (NAS 5-25667)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0038, ORSER ANALYTICAL SUPPORT
Unknown, Pennsylvania State University, University Park Campus, Graduate School, *205 Kern Graduate Bldg., University Park, Pennsylvania* 16802 (NAS 5-25702)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0039, RESEARCH OF COMBINED USE OF REMOTE SENSING AND SEISMIC OBSERVATIONS TO INFER GEOLOGICALLY RECENT CRUST DEFORMATION
S.S. Alexander, Pennsylvania State University, University Park Campus, School of Earth & Mineral Science, Dept. of Geosciences, *116 Deike Bldg., University Park, Pennsylvania* 16802 (NCC 5 12)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0040, SUPPORT FOR A REGIONAL PLANETARY IMAGE FACILITY
T.A. Mutch, Brown University, Graduate School, Dept. of Geological Sciences, *University Hall, Box 1883, Providence, Rhode Island* 02912 (NASW 3285)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

5.0041, THEORETICAL ANALYSIS OF BAROCLINIC FLOWS
B.N. Antar, University of Tennessee, Knoxville Campus, Graduate School, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (NAS 8-33386)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

5.0042, DETERMINATION OF THE SPATIAL VARIABILITY IN LOCALIZED PRECIPITATION PATTERNS
L.D. Miller, Texas A & M University, College Station Campus, School of Engineering, Dept. of Agricultural Engineering, *P.O. Box F E 44, College Station, Texas* 77843 (NCC 5 15)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0043, ANALYSIS OF REMOTE SENSORS FOR POLLUTION
T.H. Park, College of William & Mary, Williamsburg College, Graduate School, *Ewell Hall, Williamsburg, Virginia* 23185 (NCC 1 16)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0044, RESEARCH STUDY - STRENGTH AND CONSTITUTIVE BEHAVIOR OF SOILS IN A VERY LOW GRAVITATIONAL FIELD
S. Storre, Virginia Polytechnic Inst. & State University, Graduate School, *Blacksburg, Virginia* 24061

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

5.0045, DIAGNOSTICS OF SEVERE CONVECTION AND SUB-SYNOPTIC SCALE AGEOSTROPHIC CIRCULATIONS
D.R. Johnson, University of Wisconsin, Madison Campus, School of Natural Sciences, Dept. of Meterology, *Agriculture Hall, Madison, Wisconsin* 53706 (NAS 8-33222)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

5.0046, NAVY ENVIRONMENT - SUBMARINE AND AIRCRAFT PROFILING OF ARCTIC SEA ICE
R.W. Burling, University of British Columbia, Inst. of Oceanography, *2075 Wesbrook Pl., Vancouver, British Columbia, Canada* V6T 1W5 (DN675325; N00014-78-G-0003)

ASW/USW in the arctic require definition of the environment in order to operate. For example, acoustic propagation transmission loss has been found to be directly related to under-ice roughness. The scientific objectives are to determine the distribution of keel drafts to be expected given a known distribution of sail heights. The determination of a valid relationship between the two distributions will be of tremendous value in the prediction of safe depths for pipeline laying or submarine operations. The horizontal scales of upper and lower roughness can be compared in the same way and together the results will give fresh insight into problems such as the contribution of form drag at the ice-water interface to ice dynamics, the influence of ridges and hummocks on the heat balance of the arctic ocean and the mean growth rate of ice, the determination of the true mass transport involved in ice drifts such as the east Greenland current, and the prediction of acoustic transmission loss under ice. A field experiment will address the interaction of waves and ice in the east Greenland current.

Dr. Wadhams will continue his statistical analyses of the bottom side profiles of the ice collected by HMS Sovereign as well as all the coincident overflight data by Canadian overflights. The field experiment in east Greenland will be in cooperation with Danish scientists and will use their logistic support.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0047, STUDY OF THE IONOSPHERE USING TRANSMISSIONS FROM RADIATING SATELLITES
O.J. Cardus, Observatorio del Ebro, *Tortosa, Spain* (DF258020; AFOSR-78-3498)

AF function - radar/navigation. Deficiency - refraction and range errors. Objective - measure and predict ionospheric parameters causing deficiencies. How research contributes - results used to develop predictive models and corrective algorithms for radar and satellite navigation systems such as GPS/NAVSTAR.

VHF signals from appropriate satellites recorded and analyzed by grantee to yield long- and short-term technical variation. Analyses and reduced data delivered to AFGL for inclusion into AFGL-developed models and algorithms for operational commands.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Geophysics Lab.

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, F-15 TRAINING SYSTEM EVALUATION (OT AND E)
J.C. Reed, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223370)

To support the operational test and evaluation (OT and E) of the F-15A flight simulator evaluating the operational effectiveness of system performance in student and continuation training and by evaluating system performance when operated and maintained by military personnel in the field.

(1) Instructors and students will subjectively assess the training effectiveness of the simulator. (2) A transfer of training study will be part of the late phases of the project. (3) Scoring algorithms will be validated by comparing instructor and simulator generated ratings of performance. (4) Questionnaires and interviews will be used to evaluate the utility and effectiveness of the instructional features of the system and the console. (5) An assessment of engineering fidelity will be made by comparing simulator response to available aircraft data and pilot judgments. (6) Maintenance and reliability will be closely monitored. (7) Cost data and estimates will be collected and analyzed for incorporation into life cycle cost models. AFHRL/FT will provide consultative support in experimental design, methodology development, data collection monitoring, data analysis, and interpretation and reporting of the project results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0002, QUANTITATIVE DETERMINATION OF DIASTOLIC LEFT VENTRICULAR PROPERTIES AND DYNAMIC GEOMETRY IN THE DOG
S.A. Glantz, University of California, San Francisco Campus, Graduate School, *551 Parnassus Ave., San Francisco, California* 94122 (NCA 2-665905)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0003, DEVELOPMENT OF COMPUTER-CONTROLLED STUDIES AND A RECORD MANAGEMENT SYSTEM FOR PSYCHOPHYSIOLOGICAL RESEARCH
J. Kamiya, University of California, San Francisco Campus, Graduate School, Dept. of Psychology, *551 Parnassus Ave., San Francisco, California* 94122 (NCA 2-665904)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0004, GENERAL AVIATION PILOT TRAINING IMPROVEMENTS
Unknown, Aerospace Systems Inc., *121 Middlesex Tpke., Suite 202, Burlington, Massachusetts* 01803 (FA77WA-4014; FA160414 (TRAIS NO.))

The purpose of this contract is as follows: (1) The number of subjects from which complete data is gathered, after normal attrition, in each experimental and control group shall be a minimum of 40; (2) The control group, as well as the experimental group, shall be populated by volunteers for the complete experimental syllabus; and (3) Flight instructors assigned to conduct the ex-

perimental syllabus shall not concurrently instruct students in the control syllabus.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

6.0005, TRACKING TASK DEVELOPMENT

W. Levinson, Bolt Beranek & Newman Inc., *50 Moulton St., Cambridge, Massachusetts* 02138 (DF323010; F33615-77-C-0522)

To develop, instrument, and test a compensatory tracking task which will have wide applicability and sensitivity to a number of operator stresses induced either by alteration of the stimulus or by direct interference with the subject. Specific test instrument designs, recommendations, and data on critical parameters affecting task performance will result from this effort. The final results will provide data necessary for constructing a preliminary screening task which can be used to assess the effects of a wide range of visual counter-measures on an operator's ability to track various kinds of targets.

A contract will be initiated which will require the contractor to (1) identify and provide a rationale for factors in tracking behavior which are used in a wide range of stimulus conditions, (2) design an actual test incorporating the kinds of parameters isolated, (3) fabri-cate a breadboard test in accordance with the above design, (4) carry out a series of several pilot studies designed to provide a preliminary indication of the reliability and validity of the test concept, (5) recommend the course of future developments of the task based on the results of these experiments.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0006, VISUAL PERCEPTION THROUGH WINDSCREENS

R.G. Eggleston, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321120)

To relate the optical characteristics of aircraft forward transparencies to specific aspects of visual performance. F-111 and new geometric configurations will be evaluated. Optical deficiences include distortion, binocular disparity, multiple imaging birefringence coloration and transmission loss. The ultimate goal of this work unit will be the development of a set of visual perception measures to be used in acceptance testing of aircraft windscreens. These measures will influence the selection of optical tests. Data collected under this work unit using these measures will form the basis for setting optical specifications.

Through ground-based laboratory experimentation, this research program will be directed toward the determination of performance-limiting changes in visual perception produced by optical deficiencies in aircraft windscreens. Results will be interpreted with respect to measures of windscreen optical quality. Examination of the effects of optical distortion requires tests of: (a) visual acuity, both static and dynamic, (b) motion perception in terms of movement thresholds, velocity estimations, and two-dimensional eye-tracking accuracy, (c) distance perception with respect to static and dynamic targets, and (d) depth perception, both near and far field. The distracting influence of multiple imaging will be investigated by monitoring three-dimensional eye-tracking accuracy, while birefringence coloration effects will be determined by measuring the changes in accommodation that are produced. For all testing situations, short-term viewing influences will be differentiated from long-term viewing influences. Visual quality inspection process will be categorized, psychometrically quantified and related to optical, pilot and laboratory performance measures.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0007, PATHOLOGICAL MECHANISMS

A. Hall, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF315120)

To define the morphology and mechanisms of toxic injury at the cellular level.

To describe by light and electron microscopy and to document the pathologic change seen following toxic injury in experimental animals. To intergrate these changes with clinical chemistry and hematological changes, and then ultimately, to correlate these changes with cellular biochemistry. To perform morphometry on tissues and cells at the microscopic level. To determine the efficacy of drugs used for treatment of intoxication by evaluation of change in animal tissues and blood. To perform quality control on animals used in toxicity studies employing hydrazines and haloalkanes.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0008, DESIGN AND EVALUATION OF WORK STATIONS

K.W. Kennedy, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF320960)

New AF manned systems require crew and workstation designs that represent departures from those seen in current systems. The purpose of this effort is to derive pilot and crew body-size and biomechanical data to guide the design of crew stations and of ground support work stations. Much of this information will be used to derive new military standard to guide the design and evaluation of crew station geometries. Attention is given to safe and efficient accommodation of the variability of body sizes, proportions, and mobility characteristics, whether lightly clad or encumbered by protective equipment, and whether flying or working in normal or stressful environments.

Body size, body clearances, arm- and leg-reach capabilities, and vision envelopes are measured on subjects representative of AF personnel. Effects on these measures by varying body supports, i.e., seat back angles 10 to 75 degrees, and different environmental stresses, i.e., two to eleven gs are examined. Cockpit geometry standards will be developed during FY 77 and 78 to specify the layout of controls, design of body upports and escape envelopes of advanced systems. Three-dimensional analyses of 5th, 50th, and 95th percentile reach envelopes for men and women will be completed for the seated position (13 degree back angle, 6 degree seat) during FY 77. Analyses for back angles of 10 degrees, 20 degrees, and 30 degrees and the technique to reconstruct the reach envelopes for any back angle between 10 degrees and 30 degrees will be developed during FY 77. Effects of encumbering personal-protective equipment on these measures are also evaluated. Interact with other federal agencies on programs of mutual interest. Provide consultation and support in research primarily of interest to other federal agencies.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0009, COMMUNICATION MEASUREMENT SYSTEM

R.L. McKinley, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF321340)

Future requirements of AFR 161-35 and more powerful propulsion systems of current and future aircraft call for research and evaluation of many different communication systems and devices. The objective of this effort is to develop and implement a research and testing system to simulate an operational communication environment and to develop standard research and testing procudures, and data reduction software for evaluation of AF voice communication systems and devices. This effort will support ASD life support SPO's and weapons systems development SPO's.

The approach is to develop a laboratory aircraft voice intercommunication system which is capable of reproducing a realistic and valid simulation of the operational environment. This will include a multi-station intercommunication system, a respiration system, appropriate terminal equipment (helmets, masks, headsets, etc.), accurate simulation of the spectra and levels of specific weapons systems air and ground noise environs, radio static, auditory warning signals if feasible and various communication situations such as quiet to noise, noise to noise, and the like. The final experimental procedures will be standardized and software developed to provide descriptions of communication effectiveness in terms of the variables under investigation.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0010, HUMAN PERFORMANCE IN AFTI/HAC ENVIRONMENTS

D.N. Toth, U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab., *Wright Patterson A.F.B., Dayton, Ohio* 45433 (DF323700)

To quantify human performance associated with multiple axes acceleration stressors and to develop technologies to exploit the maneuvering potential of vectored force fighter designs in air to air and air to ground combat. To formulate a mathematical model to describe human performance under these multi-axes accelerations.

Multidisciplinary research programs involving the dynamic environment simulator (DES), human subjects, g seats, varied controls, restraints, cockpit displays and performance variables will be conducted to develop human operator models and evaluate alternative hardware configuration and pilot performance under multi-axes acceleration. One specific purpose of this research is to establish pilot performance capabilities while flying in plus or minus 5 gy and a plus or minus 3 gx direct side force maneuvers.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0011, APPLIED TOXICOLOGY OF UNSATURATED CHLORINATED HYDROCARBON CONTAMINANTS FOUND IN VARIOUS NAVAL OPERATIONAL ENVIRONMENTS

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The toxic properties of the unsaturated halogenated hydrocarbons and other materials found in naval operational environments have been described on a phenomenological level. The objective of this work unit is to investigate in depth the mechanisms by which the toxicity of these chemicals is expressed. Only from such detailed studies can data be developed that will allow the establishment of reasonable, accurate and defensible guidelines for control of toxic environments.

1,1-dichloroethylene (1,1-DCE), identified as a trace contaminant in submarine atmospheres, causes liver damage in rats and is suspected of causing cancer in mice. The toxic effects of 1,1-DCE on the liver and kidney and its metabolism will be studied in rodents. The role of metabolism in producing a toxic intermediate from 1,1-DCE will be examined and the factors controlling the production and subsequent inactivation of toxic intermediates will be investigated in rats exposed to low, atmospheric concentrations of 1,1-DCE. Data obtained in these studies will be used to defend suggested limits for exposures to 1,1-DCE.

SUPPORTED BY U.S. Dept. of Defense, Naval Medical Research & Development Command, National Naval Medical Center

6.0012, ENERGY EXPENDITURE PREDICTIVE MODEL FOR HUMAN OPERATOR PERFORMANCE

D.B. Rogers, University of Dayton, Research Inst., *300 College Park Ave., Dayton, Ohio* 45469 (DF323820; F33615-78-C-0501)

To develop a unique performance prediction model based on human energetic and workload parameters during acceleration. This modeling approach is in an unexplored area and is of particular importance for evaluation of life support equipment and potential performance limiting factors in new high agility aircraft.

Current models of humans exposed to acceleration forces are primarily cardiovascular models which use visual dimming and light loss as determining criteria. Advances in aircraft technology that allow for high sustained g flight maneuvering now dictate that acceleration effects on workload, fatigue and vision be alleviated by physiological or life support means. A preliminary study of available data indicate that oxygen consumption of the human is related to the incipient g level in a predictable manner. Thus, the relationship between the energetic workload and pilot performance during acceleration will be established in a system effectiveness context. This study will provide a systems construct which will establish a comprehensive predictive model for performance in sustained acceleration.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Aerospace Medical Research Lab.

6.0013, CARDIAC FUNCTION AND EXERCISE TRAINING

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SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0014, RENAL RESPONSES TO WATER IMMERSION

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SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

6.0015, DEVELOPMENT OF A PHOTOSYNTHETIC LINK IN A CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM

P.W. Morgan, Texas A & M University, College Station Campus, Agricultural Experiment Station, Dept. of Plant Sciences, *College Station, Texas* 77843 (NAS 9-15873)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

6.0016, VALIDATED DENITROGENATION PROCEDURES FOR HIGH ALTITUDE OPERATIONS

J.D. Adams, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322300)

This effort will develop more effective procedures for the prevention of decompression sickness during exposure to potential decompression hazards. A significant number of cases of decompression sickness occurs each year in USAF and other aerospace operations. This suggests current procedures for its prevention are not optimally effective. In addition, unusual conditions have arisen where established denitrogenation schedules do not exist or are ineffective, such as flying after driving, minimum frequency of high altitude exposure, the impact of interruption in denitrogenation, differences between male and female denitrogenation rates and prebreathing with less than 100 percent oxygen for on-board oxygen generating systems. Past efforts of defining decompression hazards and establishing preventative measures have used empirical and subjective testing of humans in altitude simulators with symptoms of decompression sickness being an endpoint. Recent advances in technology have provided the ability to use non-invasive methods to develop required preventative criteria. These new methods are not only more precise but involve less risk to human subjects and are lower in cost. This effort will be directed towards the development and use of these objective techniques to develop more optimal preventative measures in a wide variety of current aerospace decompression problems.

The value of non-invasive techniques to monitor the condition of human volunteers both during the prebreathing and the actual exposure phases of simulated high altitude missions will be tested. During the prebreathing phase, nitrogen washout will be monitored, and during the altitude exposure phase bubble formation will be studied. Human subjects will be tested by a non-invasive technique for monitoring and evaluating the state of denitrogenation under various aerospace operational profiles. Denitrogenation curves will be used to evaluate and establish oxygen prebreathing criteria for various missions including those employing 100 percent oxygen or gas mixtures from on-board oxygen-generating system. Specific efforts will include: establishment of minimum safe excusal period between repeated high altitude exposures, determination of whether 15 minute or 30 minute denitrogenation schedule should used before physiologic training flights, evaluation of the effects of airbreathing interrup-

tion in denitrogenation, and determination of effects related to individual human characteristics.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0017, DEVELOPMENT OF DIAGNOSTIC CRITERIA FOR SIGNIFICANT HYPERTENSION IN AIRCREW MEMBERS

D. Hull, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321840)

Uncontrolled hypertensive cardiovascular disease can lead to sudden incapacitation and its treatment has the potential of obviating performance of flying duties. This effort will define criteria for diagnosing true hypertension in contrast to labile blood pressure elevations where drug therapy is indicated, and the adequacy of blood pressure control while on waiverable medications.

Correlate the blood pressure responses during routine activities, orthostasis, and exercise in hypertensive and normotensive aircrew-members. The presence or absence of cardiac involvement will be assessed via vectocardiography and echocardiography and will be correlated with the blood pressure responses to various stresses in normotensive, hypertensive (with and without drug therapy), and labile hypertensive aircrewmembers. This work was formerly documented under work unit 7755-01-05.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0018, COLD STRESS AND IMMERSION - ASSESSMENT OF PROTECTIVE MEASURES

S.A. Nunneley, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF320170)

The goal is to optimize anti-exposure protection for USAF operations over cold water. ASD has requested realistic guidance which will allow operational units to select a clothing ensemble which causes minimal encumbrance consistent with reasonable safety standards. These will take the form of tables entered with water temperature and predicted maximal pick-up time.

A stepwise approach is necessary, as follows: (1) determination of air and water CLO values (performed at USARIEM per MOA), (2) preliminary guidance to field, (3) development of computer model for prediction of self-help and survival limits, (4) validation of same, and (5) revision of field guidance. All work is being coordinated with USN (NADC).

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0019, HUMAN CAPABILITY VALIDATION OF LIFE SUPPORT EQUIPMENT

R.L. Stork, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322660)

During the past four years, a close alliance has evolved between USAFSAM and the 412A life support SPO, based largely on the human compatibility evaluation of life support equipment. That work was previously done in work unit 7164-17-11, and due to a divisional restructuring, was transferred to this work unit. The goal of this work unit is to provide an independent Air Force judgment on the effectiveness of new aircraft equipment, and to identify problems associated with new concepts prior to the cost, risk, and visibility of a field OT and E.

Evaluation of criteria and human compatibility will be documented under this work unit, when data indicate a need for new or revised criteria, specifications, or technology, coordination/hand-off to the relevant work unit will occur. Close coordination will be established and maintained with potential USAF customers such as 412A life support SPO and ASD. Evaluation requirements are usually short-term and will be partially or fully reimbursed.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0020, INTEGRATED AEROMEDICAL DATA BASE AND DECISION SYSTEM

G. Tolan, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF322070)

The primary objective of the integrated aeromedical data decision system is to facilitate follow-up studies on fliers evaluated in the past in order that waiver authorities can better determine whether today's fliers with the same findings should be returned to duty. Additional objectives include identifying candidates for special studies, determining the probability of obtaining a waiver for any given condition, and describing the medical profile of special study groups.

In order to reduce data capture errors, state-of-the-art as well as innovative methods will be implemented that capture data as close in time and place to its creation as is possible. Data will then be machine verified and echoed back to its source for reconfirmation. In order to permit correlation of a patient's data across different source-oriented medical data repositories, an algorithm for verifying each patient's unique identifier will be implemented. In order to protect uniquely identifiable medical data from unauthorized access or alteration, while simultaneously increasing the data availability to the end users, repositories will be incorporated into a data base management system. Efforts were previously under work unit 7755-14-08.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0021, MICROWAVE EFFECTS

T.J. Tredici, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF323050)

The objective of this unit is to provide detailed initial ophthalmologic evaluation and follow-up, as clinically indicated, for those USAF personnel who have suffered a microwave overexposure, i.e., normally those calculated to have been exposed to greater than twice the permissible exposure limit (PEL). This work is further directed by Air Force regulation 161-42. Finally, attention will be focused on the presence or absence of lenticular lesions and their possible causal relation to the microwave exposure.

Patients will be evaluated in the ophthalmology branch, clinical sciences division, following standard patient evaluation protocols. Follow-up over time will be established on an individual basis and reports will be made to the referring physician and medical facility. When sufficient data have been accumulated, scientific publication of the material will be made in scientific journals. Work was formerly documented under work unit 77550905.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0022, OPTIMAL SINGLE LEAD EXERCISE ELECTROCARDIOGRAPHIC LEAD SYSTEM FOR IMMEDIATE RISK FUNCTION EVALUATION IN THE FIELD

R. Wolthuis, U.S. Dept. of Defense, Air Force, School of Aerospace Medicine, *Brooks Air Force Base, San Antonio, Texas* 78235 (DF321630)

At the present time exercise stress testing is conducted in a non-standardized fashion throughout the Air Force and, as a result, many of the stress tests are uninterpretable. This effort will define an optimal single lead electrocardiographic lead system which has a high degree of sensitivity and specificity for detecting coronary disease in the aircrew member for use during dynamic stress testing and at the same time can be used Air Force-wide with little expenditure of resources or skill.

Multiple leads will be recorded during exercise stress testing of aircrew members for measurements utilizing automated ECG analyses. These measurements will be compared to the results of the clinical evaluations including coronary arteriography and the cardio-pulmonary responses to stress testing. Various dynamic stress tests will be utilized to establish a single lead system that has applicability to the various forms of stress testing available throughout the AF. This work was formerly documented under 7755-01-05.

SUPPORTED BY U.S. Dept. of Defense, Air Force, School of Aerospace Medicine

6.0023, ANALYSIS OF VOLATILE METABOLITES IN BIOLOGICAL FLUIDS AS INDICATORS OF PRODROMAL DISEASE CONDITIONS
A. Zlatkis, University of Houston, Graduate School, *3801 Cullen Blvd., Houston, Texas* 77004 (NAS 9-15882)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, NUMERICAL METHODS FOR PREDICTING HIGH REYNOLDS NUMBER FLUID FLOWS
A.J. Chorin, University of California, Berkeley Campus, School of Letters & Science, Dept. of Mathematics, *Berkeley, California* 94720 (DN223123; N00014-76-C-0316)

The development of reliable procedures for solving the Navier-Stokes equations, numerically, will lead to accurate predictions of the flows about aircraft, ships and missiles, and, consequently, to much better methods for optimizing their performance. The purpose of this research is to develop techniques for solving the Navier-Stokes equations by transcending the limitations of present finite-difference and finite element techniques which are restricted to relatively low Reynolds number flows.

This research is of an extremely exploratory nature examining, among others, gridless techniques for high Reynolds number flows. Such flows will be decomposed into a smooth flow in which concentrated vortex blobs will be imbedded. These vortex blobs are generated at solid boundaries. The flow is determined by following the dispersal of the blobs throughout the flow until convergence, in some mean sense, is reached.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

7.0002, A STUDY OF THE TRANSPORTABILITY CHARACTERISTICS OF THE MINI-VICAR IMAGE ANALYSIS SYSTEM
R.L. Danielson, University of Santa Clara, School of Engineering, Dept. of Electrical Engineering, *Santa Clara, California* 95053 (NCA 2-685907)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0003, ANALYSIS AND DESIGN OF FAULT TOLERANT COMPUTER SYSTEMS
J.P. Hayes, University of Southern California, School of Engineering, Dept. of Electrical Engin, *3551 University Ave., Los Angeles, California* 90007 (DF049080; AFOSR-77-3352)

AF function - to promote the design and theory of fault tolerant computers, and their diagnosis and reconfiguration in a computer network. Deficiency - increasing demands are being placed on microprocessors and minicomputers for real-time applications such as controlling the aerodynamic surfaces of an aircraft. There is an urgent need for methods for designing such systems so that if a fault occurs, the overall system will still operate satisfactorily. Objective - to develop better models and procedures for the recovery and configuration of a computer network when a fault has been diagnosed. How work contributes - the results of this research will be of great importance in designing future microprocessors which will satisfy the requirement for ultrareliable computing.

A graph model of computer network has been devised. This model has been shown to be valuable for the study of fault diagnosis. The work will be extended to achieve a larger model which can be used effectively to study the best ways to carry out the necessary reconfiguration and recovery after a fault is discovered. The properties of bit-sliced microprocessors will be investigated that relate to their reliability and fault tolerance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0004, NUMERICAL ANALYSIS
T.B. Gray, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (8DJ4 09 40)

PROJECT OBJECTIVE: Provide consulting and programming services in the area of numercial analysis and computer utilization in support of work on the solar-terrestrial environment research.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

7.0005, PROBLEMS IN OPTIMAL REPEATED MEASUREMENTS DESIGNS, ROBUST OPTIMAL DESIGNS, SURVEY DESIGNS AND DESIGNS WITH VARIABLE SUPPORT SIZES
A. Hedayat, University of Illinois, Chicago Circle Campus, School of Liberal Arts & Sciences, Dept. of Mathematics, *601 S. Morgan St., Chicago, Illinois* 60680 (DF044090; AFOSR-76-3050)

AF function - improve the methods of data collection. Deficiency -there is a strong need in the Air Force to reduce costs and save time in the collection of large amounts of data, such as communication, equipment testing, and aerospace medicine data. Objective - the reduction in costs and time should be done clearly without any damage to the statistical quality of the data being collected. How work contributes - improves the methods used in investigation using experimental units that are scarce and/or costly and thus have to be used in several experiments, or in investigations where the experimenter might be interested in discovering whether or not a trend can be traced among the responses obtained by successive applications of several treatments on a single experimental unit. Improve the methods of analysis for data collected in hostile environment which often results in incomplete and/or questionable data. Methods to be developed can help in the study of relationships between biomedical measurements within and between individuals to provide improved input to such decisions as flight clearance.

Research will be conducted leading to new statistical design of experiments which can help the researcher from the beginning to the final stage of his experiment. The main problem areas to be studied are (1) characterization and construction of optimal repeated measurements designs, (2) theory and applications of bib designs with variable support sizes, (3) generalized Youden designs of practical sizes, (4) robust optimal designs, (5) further developments in the area of trade-off.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0006, NATURAL HUMAN-TO-MACHINE INTERFACES FOR NASA MISSION DATA SYSTEMS
Unknown, University of Maryland, College Park Campus, Graduate School, *College Park, Maryland* 20742 (NAS 5-25764)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

7.0007, INFERENCE UNDER ORDER AND SMOOTHNESS RESTRICTIONS WITH APPLICATIONS IN TIME SERIES ANALYSIS
E.J. Wegman, University of North Carolina, Chapel Hill Campus, School of Arts & Sciences, Dept. of Statistics, *Chapel Hill, North Carolina* 27514 (DF041150; AFOSR-75-2840)

Air Force function - vibration control, sonic fatigue, signature control/masking, forecasting ionospheric outages, study of amplitude and phase fluctuations for signals from VHF to l band, identification of plum signature, effect of nuclear detonation on

radar and optical systems, guidance errors as a function of motion field, atmospheric optics. Deficiency - a weakness of isotonic estimation procedures has always been that they are step functions, hence not continuous. Often it is known that the function to be estimated is continuous as well as isotonic and, hence, the usual isotonic estimator is unsatisfactory. Objective - it is proposed to develop a theory of isotonic splines, which would incorporate both the smoothness and the order-preserving properties. This would include development of computational algorithms and presumably some results to show that the isotonic splines were norm-reducing and that they preserved optimality properties such as maximum likelihood. How work contributes - find optimal methods for estimating smooth functions under some order restrictions.

The trend in a time series often shows a monotone or oscillating character. The estimation and removal of such trend would be a clear and useful application of the theory of isotonic splines and isotonic regression. In response problems it is of practical importance to estimate either the impulse response function or the filter weights under the assumption of isotonicity and, where appropriate, smoothness. The gain and phase shift are often used to investigate the action of filters. In particular the gain is frequently known to be smooth and satisfy some order relationship. Hence estimation of gain and phase under order and smoothness restrictions would be of particular importance. A related aspect is to develop methods to test hypothesis that a filter had a prespecified gain or phase shift function.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0008, ADI RELAXATION ALGORITHMS APPLIED TO GRID GENERATION

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SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

7.0009, DISTRIBUTIONAL WEIGHT FUNCTIONS AND ORTHOGONAL POLYNOMIALS

A.M. Krall, Pennsylvania State University, University Park Campus, School of Science, Dept. of Mathematics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (DF050460; AFOSR-78-3508)

AF function - aerospace vehicle design and operation. Opportunity - a new mathematical idea promises to unify and extend the applicability of a technique used in engineering and logistics. Objective - to extend useful theorems in Fourier analysis to functions orthogonal under distributional weight functions.

Fourier analysis is a common tool in fields including statistics, differential equations, and communications theory. Elementary use requires function sets orthogonal with respect to some weight function. Professor Krall has enlarged the usable function sets by including DIRAC delta function derivatives in the weight functions. Examples include Bessel and certain laGuerre and Hermite polynomials not previously treated as orthogonal.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

7.0010, INVESTIGATION OF STOCHASTIC CONTROL SYSTEMS

H. Kushner, Brown University, Graduate School, Dept. of Applied Mathematics, *University Hall, Box 1883, Providence, Rhode Island* 02912 (DN123377; N00014-76-C-0279)

Modern weapons systems and automatic ship and aircraft steering systems require more powerful mathematical methods of solution and analysis of complex control systems. It is the purpose of this research to study control problems in which statistical noise is present. This can be taken to represent uncertainties in the atmospheric or ocean environment, exact values of important parameters, etc.

The principal investigator will seek computational algorithms for computing optimal stochastic controls or useful approximations to them. This work will use techniques from a wide range of mathematical areas including probability theory, differential equations, and numerical analysis.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, THE MOTION OF PARTICLES IN INTERSTELLAR SPACE RELEASED FROM A NUCLEAR WASTE PAYLOAD CONTAINER

A.C. Williams, Alabama Agricultural & Mechanical University, Graduate School, *Normal, Alabama* 35762 (NSG 8068)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

8.0002, ABSORPTION BY SO2 IN THE NEAR UV AND VISIBLE SPECTRAL REGIONS WITH APPLICATIONS TO VENUS' ATMOSPHERE

R. Nanes, California State University & Colleges, California State University, Fullerton Campus, School of Mathematics Science & Engineering, Dept. of Physics, *800 N. State College Blvd., Fullerton, California* 92631 (NCA 2-253901)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0003, GROWTH OF LARGE SINGLE CRYSTALS OF GAN

W.A. Tiller, Stanford University, School of Engineering, Dept. of Materials Science & Engin, *Stanford, California* 94305 (DN890057; N00019-78-C-0105)

The primary objective will be to study in depth the existing information concerning the preparation and properties of GaN single crystals and to study the applicability of several new techniques toward the growth of large crystals.

The GaN investigation will consist of 2 phases, namely (1) an analytical review and theoretical analysis of existing crystal growth procedures and of thermodynamic data relevant to possible new methods and (2) an experimental program. In phase 1 existing techniques for the preparation and growth of GaN will be evaluated for suitability to the growth of large crystals. Phase 2 will be a concurrent experimental program which at the outset will focus on two methods: (1) solution growth (Ga solvent) in a temperature gradient and (2) growth from solutions with enhanced nitrogen solubility.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

8.0004, CHARACTERIZATION OF INFRARED OPTICAL PROPERTIES OF TRANSPARENT MATERIALS

R. Braunstein, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DF053070; AFOSR-78-3665)

AF function - high energy laser science and technology is finding wide application in future Air Force systems. Opportunity - both in the generation of intense infrared coherent radiation and in the hardening of certain critical components to this radiation, understanding the basic interactions of photons with transparent solids is of extreme importance for the advancement of high energy lasers. Objective - the broad objectives of this research are to further understanding of the intrinsic and extrinsic processes that characterize the infrared optical properties of materials. Intrinsic interactions such as Rayleigh scattering, multi-phonon absorption and other higher order processes and the nature of the Urbach tail will be studied by experimental and theoretical techniques. Extrinsic processes such as the identification of chemical and structural imperfections as a function of temperature and pressure which occur in highly transparent semiconductors and insulators

will be investigated. In addition to bulk optical properties, the optical properties of interface states between materials as well as disorder engendered by various methods of material preparation will be studied. How work contributes - the knowledge and understanding gained from a successful completion of these objectives will provide a basis for evaluating infrared laser window materials, optimizing their performance and evolving a predictive mechanism for their optical degradation and breakdown.

Three experimental approaches using wavelength modulation, light scattering, and thermally stimulated depolarization currents will be used to obtain information about intrinsic and extrinsic loss mechanisms in highly transparent materials. A unique wavelength modulated spectrometer will be employed to determine the spectral dependence of the absorption in these materials. Rayleigh optical scattering will be used to study the dynamics of density and concentration fluctuations in highly transparent materials. In addition, the method of thermally stimulated depolarization currents will be used to study dipole moment bearing defect states so as to determine the relaxation time and activation energies of these species. The results of these experiments will be used to develop the theoretical understanding of the loss processes occurring in highly transparent insulators and semiconductors.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0005, COMMUNICATIONS - MAGNETIC ALLOYS AND ORGANIC CONDUCTORS

R. Orbach, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DN123150; N00014-75-C-0245)

This work involves the development and analysis of new classes of materials for usage in display devices, magnetic amplifiers, electronic circuits, and information storage in naval systems in surveillance and communications.

The physical properties of conducting organic solids will be investigated theoretically by developing new models of charge transfer in quasi one-dimensional narrow band solids. Electron spin resonance will be used to investigate dilute magnetic alloys that have nearly unstable moments and exhibit large negative exchange coupling. Additional work will be undertaken to investigate the effect of the large negative exchange coupling on negative thermopower in dilute magnetic alloys. Additionally, an investigation of fluctuations in granular superconductors near the superconducting transition temperature will be carried out.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0006, INVESTIGATION OF LIQUID DROP DYNAMICS IN ZERO GRAVITY

J.P. Vanyo, University of California, Santa Barbara Campus, School of Engineering, Dept. of Mechanical Engineering, *Santa Barbara, California* 93106 (NCC 2 11)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

8.0007, SURVEILLANCE - COHERENT SPECTROSCOPY

J.L. Hall, University of Colorado, Boulder Campus, Joint Inst. for Lab. Astrophysics, *1200 University Ave., Boulder, Colorado* 80302 (DN875020; N00014-77-C-0656)

The technical objective of this contract is to investigate coherent optical transient phenomena occurring in atomic systems. This work is important to the Navy because it will provide a more detailed understanding of the interaction of atomic systems with coherent (laser) radiation fields.

The approach will use a high velocity monoenergetic beam of metastable atoms which is crossed with and traverses through several spatially separated light beams. The resulting interference effects will be carefully analyzed and will provide detailed information on coherent optical transients. This approach is formally equivalent to stationary atom being excited by a light pulse in which the width of the pulse is determined by the transit time of the atom through the light beam. An important advantage of this technique is that pulses of special width, e.g., N pi, can be tailored by proper choice of atomic velocity, laser intensity, and/or beam size.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0008, HEAVY-ION BEAM PROGRAM

J.M. Kiddano, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN680431)

We propose to study heavy-ion interactions with tissue-like targets in the energy region 100-500 mev/U. Measurements will be made of production cross sections for secondary particles and their transverse momentum distributions. Results are applicable to cellular radiation biology, cancer therapy and spacecraft shielding calculations. Calculations of dose and linear energy transfer (LET) distributions will be made for various heavy-ion beams.

Experiments are to be conducted at the Lawrence Berkeley Laboratory, where beams of atomic number 6 less than z less than 36 are available from the BEVALAC accelerator. Targets of tissue-like materials, e.g., C.,N.,O. will be used. The detector system will measure production angles, multiplicities, time of flight, energy deposition and ranges. This information is sufficient to determine the differential cross sections and transverse momentum distributions as well as the total inclusive cross sections.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0009, RESEARCH IN PHASE TRANSFORMATION IN NAVAL MATERIALS WITH PARTICULAR EMPHASIS ON HIGH TC SUPERCONDUCTORS

E.F. Skelton, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN620076)

To develop new materials with high superconducting transition temperatures for ultimate application in naval weapon systems. To this end, theoretical and experimental research is being directed toward improved understanding and characterization of interactions between high superconducting transition temperatures and crystalline lattice instabilities. Major activities also include the application of unique high pressue/high temperature facilities to synthesize new superconducting materials.

Includes high pressure/low temperature x-ray studies, compression, specific heat, and electron transport measurements, high pressure/high temperature synthesis techniques and theoretical investigations of lattice dynamics and electronic properties.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

8.0010, THE MODELING OF THE SOLAR UPPER PHOTOSPHERE AND LOWER CHROMOSPHERE BASED UPON ATM DATA

J.N. Heasley, University of Hawaii System, Manoa Campus, Graduate School, *Spalding Hall, Room 359, Honolulu, Hawaii* 96822 (NAS 8-33219)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

8.0011, ELECTRONICALLY INDUCED PHASE TRANSFORMATIONS

A.J. Freeman, Northwestern University, Evanston Campus, School of Arts & Sciences, Dept. of Physics, *633 Clark St., Evanston, Illinois* 60201 (DF042710; AFOSR-76-2948)

AF function - this proposed research primarily falls in the 2.3 and 2.1 research objectives, which deal with electromagnetic materials and the metal working fundamentals. Materials in use today are operating at or near their capacity as regards to stress, temperature and environment. It is necessary to prolong use of current systems and envision new ones which will have extreme reliability. The characterization of these new materials as well as understanding the fundamental properties which cause phase

transformation constitute the scope of this research. Deficiency - electronic materials have become increasingly important for scientific research because of the great potential they have demonstrated for various technological applications. Electronically induced phase transitions which occur in many metals are a mixed blessing; at times, they destroy some of the very properties important to these applications. The better understanding of transitions in these materials show promise of more economical devices accessible to a wide range of application. Objective - the objective will be to use novel theoretical techniques developed by the principal investigator to obtain detailed first-principle understanding of the behavior and characteristic properties of several important classes of materials (BCC to omega phase transition metals and the formation of charge density waves in transition metal di-chalcogenides). Contribution - this research is a part of a comprehensive program to support the work in quantum physics of matter studying phase transitions in materials.

The approach to be taken in this proposal is to study the electronically driven instabilities of the conduction electrons in metals by investigating the divergencies in the generalized static electronic susceptibility. Fundamental studies of electronically driven phase transformations, e.g., spin density waves, charge density waves, and structural phase transformations, (which compete with the superconducting phase transition) are essential in order to obtain a better understanding of the interactions responsible for the transformations. Novel theoretical techniques developed by the principal investigator will be used to obtain a detailed first principle understanding of the behavior and characteristic properties of several important classes of materials, including the transition metal dioxides and the transition metal dichalcogenides. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0012, INVESTIGATION IN LIQUID HELIUM OF BULK TURBULENCE GENERATED BY ULTRASOUND IN THE MEGAHERTZ RANGE

C.W. Smith, University of Maine, Orono Campus, School of Arts & Sciences, Dept. of Physics, *36 Winslow Hall, Orono, Maine* 04473 (DF045790; AFOSR-76-3113)

AF function - this proposed research primarily falls in the 5.3 research objectives which deal with electrical power for manned and unmanned aircraft, satellites and space stations. Research is required in the generation of usable electric power from nonnuclear energy sources, distribution and conditioning of the power and the attendant material requirements. The superconducting generators and pulsed superconducting energy storage systems have the requirement that the temperature of the systems be below the critical temperature. Thus one needs to understand the best transport and other physical properties of liquid helium. Deficiency - as an example of the reason one needs more efficient ways of keeping the system cool, over 90 percent of the weight of a superconductive energy storage system results from the cryogenic coolant and its storage container. Objective - they propose a study of microbubble states and their relation to cavitation phenomena and charge-carrying states in liquid helium. Special emphasis will be given to the nucleation of microbubbles, their growth and stability, their population dynamics, their interaction with other liquid helium phenomena, and their decay. Based on results already obtained in their laboratory, it appears now that they have a unique technique with which to study microbubble states. Contribution - this research is a part of a comprehensive program in super fluids and superconductors.

While work has been done on bubble nucleation and the electron bubble state, the use of the electron bubble as a probe of the sonicated liquid state provides a new approach to the examination of liquids. This straightforward technique was conceived at the PI's laboratory. Its potential for investigating fluid media is extensive. The proposed study encompasses both basic and applied aspects of processes in liquids involving charge transport, bubble nucleation, stability and decay, electron bubble formation and its interaction with sound and cavitation. This analytical technique will enable them to answer many questions raised concerning liquid phenomena and to provide the data necessary for the utilization of ultrasound as a diagnostic tool to aid in the use and control of cryogenic liquids under a variety of laboratory, commercial, space, and military conditions.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0013, GEOMAGNETIC PULSATIONS - PRODUCTION/INTERPRETATION

M.P. Hagan, Emmanuel College, Graduate School, Dept. of Physics, *400 the Fenway, Boston, Massachusetts* 02115 (DF050140; AFOSR-77-3467)

AF function - disturbances in near earth space, such as geomagnetic storms, can degrade the performance of Air Force communication systems. Geomagnetic pulsations are believed to be a promising diagnostic tool for specifying and forecasting such disturbances. Deficiency - an explanation of geomagnetic micropulsations is required that incorporates the observed features of the experimental data. Objective - to establish a detailed phenomenology of geomagnetic pulsations both in the auroral oval and mid-latitude regimes. Contribution - a thorough analysis of the properties of geomagnetic pulsations is necessary to generate and validate theories of hydromagnetic wave propagation, which can be used to predict and specify geomagnetic disturbances.

A study will be made of the polarization properties of geomagnetic pulsations previously recorded at Strawberry Hill, Massachusetts. The analysis will determine the nature of magnetospheric resonances and the relative importance of hydromagnetic wave activity and electrical current systems as sources of the pulsations. Results will be compared with signals recorded at the AFGL magnetometer network to verify and extend previous results on the statistical properties of both the auroral oval and mid-latitude regimes of geomagnetic pulsations.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0014, MICROWAVE EMISSION FROM RELATIVISTIC ELECTRON BEAMS

G. Bekefi, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DF046580; AFOSR-77-3143)

AF function - this research supports requirements for the development of high power, coherent sources of microwave, millimeter, and submillimeter radiation for applications in radar, electromagnetic warfare, and communications. Deficiency - no developed sources which can produce gigawatts of microwave power at centimeter wavelengths, or megawatts of power at submillimeter wavelengths are presently available. Objective - the aim of this research is to characterize the microwave emission mechanism in the relativistic magnetron by measuring the power versus frequency and the mode structure, to modify the magnetron geometry to increase the radiation efficiency, and to use the magnetron as a pump source for a stimulated scattering experiment. Contribution -this research will contribute to the development of an ultra-high power magnetron source of microwave radiation which will advance our capabilities in radar, electronic warfare, and communications.

The theoretical portion of the program will consist of a computer simulation of the operation of the magnetron to better understand the mode structure. The experimental portion can be divided into two parts -(a) the effect of 'priming' the magnetron will be investigated. Priming is a known technique for getting a tube to operate in a desired mode by injecting a low level signal at the frequency of the desired mode prior to the application of the high voltage. Since the magnetron operates in a zero mode, MIT will investigate the effect of priming at the zero mode frequency. Since PI mode operation conventionally has been the preferred mode of operation, they will also determine if PI mode priming will cause high power in that mode. A priming magnetron of 800 KW and 1 microsecond pulse duration will be used for this experiment. (b) the coaxial stabilized magnetron is a good design for getting clean operating modes. A coaxial relativistic electron beam magnetron will be constructed with less than ten resonant cavities, to operate in both the zero and PI modes. The coaxial magnetron is frequency tunable over a small range and also has the additional advantage of good control over the cavity energy storage.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0015, ELECTRICAL COMPENSATION IN INP
B.L. Mattes, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Electrical & Computer Engineering, *Ann Arbor, Michigan* 48104 (DN890095; N00019-78-C-0406)

Conduct a research study on electrical compensation in indium phosphide (InP) produced by background impurities and structural defects.

The approach will be to study impurity background compensation by growing a series of InP liquid phase epitaxial layers in several growth systems (e.g., SiO2:C:H2; SiO2:Bn:H2; SiO2:Bn:Ar) at different bakeout temperatures with periodic bakeouts between each growth. The initial objective will be to determine the cause and effect of C impurity contamination in the InP epitaxial layers. In the structural area the initial work will be to examine the substrate and growth surfaces and the substrate-layer interface.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

8.0016, SERVICES TO PERFORM RESEARCH IN ACOUSTICS
Unknown, University of Minnesota, Minneapolis Campus, Graduate School, *322 Johnston Hall, Minneapolis, Minnesota* 55455 (NCA 1-23)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

8.0017, EXPERIMENTS EMPLOYING A ROCKET-BORNE ELECTRON ACCELERATOR
P.J. Kellogg, University of Minnesota, Minneapolis Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *322 Johnston Hall, Minneapolis, Minnesota* 55455 (NSG 5373)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0018, THEORETICAL PHYSICS
A.S. Wightman, Princeton University, Graduate School, Dept. of Physics, *205 Nassau Hall, Princeton, New Jersey* 08540 (PHY7823952)

Studies in theoretical physics will be done to further our understanding of basic principles and methods which are widely applied. In particular, investigation of a series of problems in quantum field theory (with possible connections to statistical mechanics and general mathematical physics) will be carried out. These include further study of lattice and continuum gauge fields, a study of non-perturbative dimensional interpolation, and aspects of exactly soluble classical and quantum models such as the non-linear sigma model.

This is the first and second years of a three-year continuing grant, previously supported under NSF grant PHY76-80958.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0019, COHERENT OPTICAL TRANSIENT SPECTROSCOPY
S.R. Hartmann, Columbia University, School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (DN875458; N00014-78-C-0517)

The technical objective of this work is to improve the understanding of the quantum mechanical interaction of radiation with atoms with specific consideration of coherent nonlinear resonant and nonresonant interaction mechanisms. This work is important to the Navy for surveillance and for developing new diagnostic techniques for studying the interaction of atoms with radiation fields and the development of new diagnostic techniques for studying atomic collision phenomena.

The interaction of atoms with either externally or internally generated intense radiation fields will be studied. In all cases an ensemble of atoms in an atomic vapor will be excited in such a way that it will develop macroscopic order and will radiate a coherent burst of light in the absence of mirrors or any optical feedback. Two specific problems will be studied. The first involves an experiment to provide the first demonstration of a two-photon echo. This experiment will be carried out in such a way that the second order optical stark shifts will cancel. The second problem will involve the study of Dicke superradiance. In particular, the objectives of this effort are to extend the observation of superradiance into the visible region, to study small sample superradiance, and possibly to address the problem of two-photon superradiance.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0020, THEORETICAL STUDIES OF DEFECTS IN TETRAHEDRAL SEMICONDUCTORS
J.A. VanVechten, International Business Machines Corp., *P.O. Box 218, Yorktown Heights, New York* 10598 (DF046100; F49620-77-C-0005)

AF function - this proposed research primarily falls in the 2.3 research objective which deals with forms of matter which possess the ability to generate, detect, process, control and otherwise usefully employ electromagnetic energy for military-related purposes. These include man-made artifacts which underlie most of the semiconductor devices, infrared detectors, electro-acoustic elements, transducers, lasers, radiation-resistant devices, nonlinear optics, integrated optics, and numerous other devices and components. Deficiency - new or improved materials are needed capable of serving as window materials in the 1-6 micron wavelength of chemical lasers and the 10.6 micron wavelength of water lasers. The chemical lasers require materials chemically inert to attacks of HF or DF. Particular research attention should be paid to the minimizing of absorbing inclusions, the temperature variation of refractive index, optical absorption and other important materials parameters. Objective - (1) the identification, by means of simple estimates of thermochemical parameters and analysis of the thermal history of a given sample, of the chemical and structural nature of the defects that ought to be present in the given sample, and (2) the theoretical determination of the electronic and optical properties of these expected defects for comparison with available experimental data. Contribution - this research is a part of a comprehensive program in radiation interaction with matter.

The PI's will continue to study the formation of dislocations and their interaction with impurities in the next year. The course of this study will be greatly influenced by the flow of new experimental data which reaches them. They shall attempt to maintain the closest possible collaboration with various experimental groups. They shall in the next year be collaborating in the study of the effect of electrolytes on the motion of dislocations particularly for the case of Si boules being sawed into wafers. The techniques to be employed include x-ray topography and etching studies in addition to TEM and electrical measurements. It is believed that the choice of electrolyte (and bias voltage) affects the charge state of dislocations and that charging of a dislocation lowers the energy barrier against its motion. Changes in the charge state of the dislocation also affect its interaction with impurities. (Text Abridged)

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0021, MATERIAL SUPPORT TECHNOLOGY - PIEZO-OPTICAL DETERMINATION OF DEFORMATION POTENTIALS IN MULTI-VALLEYED SEMICONDUCTORS
F.H. Pollak, Yeshiva University, New York Campus, School of Science, *601 W. 183rd St., New York, New York* 10033 (DN675243; N00014-76-C-0481)

Calculations of the properties of new semiconductor materials for use in electronic devices that find application in naval systems rely upon a number of material constants, many of which are unknown and difficult to determine. This program will seek to ascertain various parameters that affect transport in semiconductors.

An investigation of the stress-dependence of the optical absorption will be carried out in several III-V semiconductors. Wavelength modulated transmission and reflection will be utilized to measure both indirect and direct transitions from valence to conduction band. From the transition rates and the scattering processes, the absolute values for the electron-phonon and hole-phonon deformation potentials for intervalley processes can be determined.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0022, BASIC RESEARCH ON RADIATION-INDUCED LASERS
W.E. Wells, Miami University, School of Arts & Sciences, Dept. of Physics, *Oxford, Ohio* 45056 (NCC 1 12)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0023, ADVANCED SOLAR ENERGY CONVERSION
J.H. Lee, Vanderbilt University, Graduate School, *21st Ave. S., Nashville, Tennessee* 37203 (NCC 1 8)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0024, MEASURE ELECTRON PRECIPITATION INDUCED BY BARIUM INJECTIONS IN THE MAGNETOSPHERE - THE BARIUM GEOS EXPERIMENT (ABBREV)
W.R. Sheldon, University of Houston, School of Arts & Sciences, Dept. of Physics, *3801 Cullen Blvd., Houston, Texas* 77004 (NSG 7609)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

8.0025, OPTICAL PROPERTIES OF SEMICONDUCTORS - SOLAR CELL MATERIALS
E.J. Shiles, Virginia Commonwealth University, Graduate School, Dept. of Physics, *901 W. Franklin St., Richmond, Virginia* 23219 (DF052160; AFOSR-78-3591)

AF function - surveillance, space. Deficiency - space power systems using solar-electric energy conversion are in need of solar cell materials and designs of higher efficiencies and longer life. Some of the basic data are sufficiently uncertain that even the directions in which to proceed are not evident. Objective - to provide a better calculation of optical constants of silicon and gallium arsenside. How work contributes - optical data, which are of direct importance in the use of semi-conductors for photovoltaic purposes, will be improved by this research.

The well known Kramers-Kronig integrals will be applied to available experimental measurements of reflectivity and other optical constants, in order to extend the data over the full spectral range of interest (infrared to x-rays). The results will be evaluated by application of various sum rules, in which there apparently has been some error in the past.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

8.0026, COLLISIONAL EXCITATION AND RADIATION OF ATOMS AND MOLECULES
C.C. Lin, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Physics, *500 Lincoln Dr., Madison, Wisconsin* 53706 (DF052870; AFOSR-78-3649)

AF function - RO 3.2, optical effects in communications, surveillance, navigation, and detection systems. Deficiency - any optical/infrared sensor system operating in or above the earth's atmosphere must look through or against the background of atmospheric radiation. Objective - this research will elucidate the role played by collisional effects in atmospheric processes that generate background radiation. Contribution - further understanding of electron-induced atmospheric processes and in particular those processes producing optical and infrared emissions.

Basic research will be conducted on inelastic collision of electrons or negative ions with atoms and molecules and on the subsequent radiation from those atoms and molecules.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

SOCIAL SCIENCES

Includes Social Sciences (general); Administration and Management; Documentation and Information Science; Economics and Cost Analysis; Law and Political Science; and Urban Technology and Transportation.

9.0001, STUDY AND REPORT - COMPARISON OF GENERALIST VERSUS SPECIALIST CONCEPT IN PERSONNEL MANAGEMENT
C. Sampson, State University & Community College System of Tennessee, Tennessee State University, School of Arts & Sciences, Dept. of Political Science, *Nashville, Tennessee* 37203 (NAS 9-15862)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Johnson Space Center

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, COLLOQUIUM AND BOOK ON ASTEROIDS AND PLANETS
Unknown, University of Arizona, Graduate School, *Tucson, Arizona* 85721 (NASW 3262)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Headquarters

10.0002, SPACE TELESCOPE/HIGH RESOLUTION SPECTROGRAPH (HRS) EXTRAGALACTIC STUDIES
R.J. Weymann, University of Arizona, Graduate School, *Tucson, Arizona* 85721 (NAS 5-25733)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0003, A SSS OBSERVATION OF THE SUPERNOVA REMNANT RCW 103
G.P. Garmire, California Inst. of Technology, Graduate School, Dept. of Physics Mathematic & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (NAS 8-33352)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0004, ACQUIRE AND ANALYZE OBSERVATIONS BEFORE AND DURING THE FLASH PHASE OF SOLAR FLARES
S.S. Martin, California State University & Colleges, California State University, Northridge Campus, Graduate School, *18111 Nordhoff St., Northridge, California* 91324 (DF044490; F49620-78-C-0025)

AF function - solar flares produce high speed particle (protons-electrons) streams which cause geomagnetic storms, communications problems and high radiation levels for orbiting spacecraft. Deficiency -no theory or model of solar flares exists which can be used to predict flare occurrence and observable flare phenomena. Observational approaches have been limited by inadequate measurements of magnetic fields from which flare energy is derived. Objective - to identify fine-scale magnetic field configurations, flux levels and evolutionary changes which occur in solar active regions prior to solar flares. Contribution - this project will acquire much needed new magnetic field observations with improved spatial resolution. Special effort will be made to search for conditions and changes which might distinguish flares of geophysical significance and identify the physical processes responsible for triggering a flare. Recommendations will be made

for incorporating magnetic field measurements in flare forecasting.

New observations are to be made of pre-flare magnetic field configurations with a cyanogen bandhead filter at 3840 angstroms. Magnetic field parameters of flux, configuration, rate of change will be studied in relation to the flare parameters of size, location, intensity, frequency and pre-flare changes as measured in hydrogen alpha filtergrams. Theoretical analyses will try to develop models of flare configurations in the chromosphere and lower corona.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

10.0005, SPATIAL DISTRIBUTION OF FE LINE EMISSION IN THE VIRGO CLUSTER OF GALAXIES
K.A. Anderson, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NAS 8-33357)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0006, A BALLOON-BORNE HIGH RESOLUTION X- AND GAMMA-RAY SPECTROMETER
K.A. Anderson, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NSG 7592)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0007, THE INTERACTION OF SUPERNOVA REMNANTS WITH INTERSTELLAR MEDIUM
C. McKee, University of California, Berkeley Campus, School of Letters & Science, Dept. of Physics, *Berkeley, California* 94720 (NAS 8-33356)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0008, X-RAY IMAGERY OF NEARBY QSO 0241 AND 622
B.H. Margon, University of California, Los Angeles Campus, Graduate School, *405 Hilgard Ave., Los Angeles, California* 90024 (NAS 8-33353)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0009, STUDIES FOR ATOMIC INTERSYSTEM LINES IN INTERSTELLAR GAS AND STELLAR WINDS
J.M. Shull, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NSG 5365)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0010, VELOCITY FIELDS AND SPECTRUM PECULIARITIES IN BETA CEPHEI STARS
J.R. Lesh, University of Denver, School of Arts & Sciences, Dept. of Physics, *2115 S. University Blvd., Denver, Colorado* 80210 (NSG 5367)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0011, OBSERVATIONS OF ABELL CLUSTER
M.P. Ulmer, Northwestern University, Evanston Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *633 Clark St., Evanston, Illinois* 60201 (NAS 8-33354)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0012, GUEST INVESTIGATOR EFFORT ON THE HIGH ENERGY ASTRONOMY OBSERVATORY C-2
P. Meyer, University of Chicago, School of Physical Sciences, Dept. of Physics, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (NAS 8-33350)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0013, FAINT PHOTOELECTRIC PHOTOMETRIC STANDARD STAR SEQUENCES
A.U. Landolt, Louisiana State University, Agricultural & Mechanical College, School of Science, Dept. of Physics & Astronomy, *University Station, Baton Rouge, Louisiana* 70803 (DF047270; AFOSR-77-3218)

AF function - reconnaissance and surveillance of spacecraft. Deficiency - lack of photometric calibration of faint stars to verify detection performance of optical surveillance systems. Objective - to establish photometric standards for stars in magnitude interval 12 and 17 over as wide a range of color index as possible. Contribution - faint standard stars will permit the calibration of detectors now in use or under development.

The photographic and photoelectric data acquisition programs will continue at CTIO for the sequence stars. Sequences will be established in eight selected areas along the celestial equator and also in nine regions of the southern sky at 45 degrees declination and separated by 2.5 hour intervals in right ascension. The iris photometer testing will be completed and photographic plate measurements will be begun. The construction of a two star photometer will continue.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

10.0014, STUDIES OF THE ULTRAVIOLET SPECTRA OF ASTRONOMICAL SOURCES
H.W. Moos, Johns Hopkins University, School of Arts & Sciences, Dept. of Physics, *34th & Charles Sts., Baltimore, Maryland* 21218 (NSG 5393)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0015, COOPERATIVE RESEARCH IN SOLAR AND STELLAR ASTRONOMY
J.D. Trasco, University of Maryland, College Park Campus, School of Engineering, Dept. of Astronomy, *College Park, Maryland* 20742 (NCC 5 9)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0016, VIKING RADIO SCIENCE DATA ANALYSIS AND SYNTHESIS
I.I. Shapiro, Massachusetts Inst. of Technology, School of Science, Dept. of Geology & Geophysics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NSG 7556)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0017, INTERFEROMETRIC OPTICAL SPECTROSCOPY OF THE INTERSTELLAR MEDIUM
N.P. Carleton, Smithsonian Institution, Astrophysical Observatory, Optical & Infrared Div, *60 Garden St., Cambridge, Massachusetts* 02138 (310-4050-03)

In addition to work described by Dr. W.A. Traub, we have completed analysis of data on the detection of interstellar lithium in the S Ophiuchi cloud, showing that lithium is present, but depleted from its general cosmic abundance value, as are other metals in the gaseous component of that cloud.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0018, STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA
W.A. Deutschman, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (NAS-5-21858)

The object of this program was to determine the feasibility of observing short-lived events with the ERTS satellite and to establish event-detection criteria applicable to different categories of events. Of the 222 events we evaluated, we decided that 53 of them might be detected by the ERTS sensors. Nineteen were subsequently photographed by ERTS and studied by us. We concluded from this program that ERTS photographs are a useful and economical way for individual investigators to obtain data about short-lived events. Larger events can be detected on the photographs without knowledge of their exact location. If the general area is known and which event (e.g., a remote volcano, flood, or vegetation change) is expected to occur, the ERTS photograph can be used to determine if it actually did occur. Small-sized events can be studied if their location is known. Furthermore, from images of the events, we have received useful scientific data that cannot otherwise be easily obtained.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0019, ULTRAVIOLET SPECTROPHOTOMETRY OF PLANETARY NEBULAE
T. Barker, Wheaton College, Undergraduate School, Dept. of Physics & Astronomy, *Norton, Massachusetts* 02766 (NSG 5376)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0020, SELECTED HARDWARE FOR UNIFIED RADIO AND PLASMA WAVE EXPERIMENT FOR INTERNATIONAL SOLAR POLAR MISSION
P.J. Kellogg, University of Minnesota, Minneapolis Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *322 Johnston Hall, Minneapolis, Minnesota* 55455 (NAS 5-25753)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0021, PHOTON COUNTING IMAGE SENSOR DEVELOPMENT FOR ASTRONOMICAL APPLICATIONS
E.B. Jenkins, Princeton University, Graduate School, Dept. of Astrophysical Sciences, *205 Nassau Hall, Princeton, New Jersey* 08540 (NSG 7618)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0022, SUPPORT OF INTERNATIONAL ASTRONOMICAL UNION COLLOQUIUM NO. 54 SCIENTIFIC RESEARCH WITH SPACE TELESCOPE
L. Spitzer, Princeton University, Graduate School, Dept. of Astrophysical Sciences, *205 Nassau Hall, Princeton, New Jersey* 08540 (NSG 7600)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0023, FINITE ELEMENT RESEARCH OF THE SURFACE FIELD ADJACENT TO THE SAN ANDREAS FAULT
D.L. Turcotte, Cornell University, Ithaca Campus, School of Engineering, Dept. of Geological Science, *242 Carpenter Hall, Ithaca, New York* 14853 (NCC 5 2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0024, BACKGROUND SKY BRIGHTNESS MEASUREMENTS FOR APPLICATION TO SPACE SURVEILLANCE SYSTEMS
J.L. Weinberg, State University of New York, Albany Campus, School of Arts & Sciences, Dept. of Astronomy & Space Sciences, *1400 Washington Ave., Albany, New York* 12222 (DF044830; F49620-78-C-0013)

AF function - space object detection, identification and surveillance requires detailed knowledge of the background sky brightness. Accurate measurements must be made of the position and irradiance of celestial sources at all wavelengths. Deficiency - there has been no way to test two long-standing assumptions - (1) the description of the number density of scattering centers by a power law, (2) the independence of heliocentric distance of the light scattering characteristics of zodiacal light. Objective - to derive a detailed model of the interplanetary dust cloud, which includes both the spatial distribution and physical characteristics of the dust grains. Contribution - only a probe such as Pioneer 10/11 can determine the change of brightness with heliocentric distance. Analysis of the data will permit for the first time the inversion of the brightness integral of zodiacal light by differentiation.

The data consist of ground-based (Mt. Haleakala, Hawaii), earth-orbital (Skylab) and deep-space probe (Pioneer 10/11) observations of brightness, polarization and color over the entire sky. The separation of the zodiacal light from the background starlight is made possible by the Pioneer 10/11 observations, which show the zodiacal light to be negligible beyond the asteroid belt. The Pioneer zodiacal light data also provide the brightness as a function of sun angle and heliocentric distance. Skylab and ground-based data provide complementary information and allow the light scattering properties of the dust to be determined as a function of position on the sky and heliocentric distance.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

10.0025, PHASE FUNCTION STUDIES IN REFLECTION NEBULAE WITH THE INTERNATIONAL ULTRAVIOLET EXPERIMENT
A.N. Witt, University of Toledo, School of Arts & Sciences, Dept. of Physics & Astronomy, *2801 W. Bancroft St., Toledo, Ohio* 43606 (NSG 5388)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0026, PHASE FUNCTION STUDIES IN REFLECTION NEBULAE
A.N. Witt, University of Toledo, School of Arts & Sciences, Dept. of Physics & Astronomy, *2801 W. Bancroft St., Toledo, Ohio* 43606 (NSG 7620)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Space Science

10.0027, MASS FLOW AND EVOLUTION IN CLOSE BINARIES INCLUDING SIMULTANEOUS OBSERVATIONS OF X-RAY BINARIES
G.E. McCluskey, Lehigh University, School of Arts & Sciences, Dept. of Astronomy, *Alumni Memorial Bldg., Bethlehem, Pennsylvania* 18015 (NSG 5386)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0028, MEASUREMENT OF THE FAR ULTRAVIOLET SPECTRAL REFLECTIONS OF SELECTED LUNAR AREAS
B. Hapke, University of Pittsburgh, School of Arts & Sciences, Dept. of Earth & Planetary Sciences, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (NSG 5362)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0029, CORRELATIVE STUDIES OF COSMIC GAMMA RAY SOURCES UNDER THE HEAO-A GUEST INVESTIGATOR PROGRAM
R.C. Haymes, Rice University, Graduate School, Dept. of Space Science, *6100 Main St., Houston, Texas* 77001 (NAS 8-33361)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0030, ULTRAVIOLET SPECTROSCOPY OF SYMBIOTIC STARS, RECURRENT AND OLD NOVAE
D.L. Lambert, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Astronomy, *200 W. 21st St., Austin, Texas* 78712 (NSG 5379)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0031, MAGNETIC FIELDS IN CLUSTER OF GALAXIES
B.K. Dennison, Virginia Polytechnic Inst. & State University, Graduate School, *Blacksburg, Virginia* 24061 (NAS 8-33359)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0032, ANALYSIS AND INTERPRETATION OF X-RAY TIMING OBSERVATIONS
P.E. Boynton, University of Washington, School of Arts & Sciences, Dept. of Astronomy, *Seattle, Washington* 98105 (NAS 8-33360)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Marshall Space Flight Center

10.0033, KINEMATICS AND PHYSICAL CONDITIONS IN SHOCKED CLOUDS IN SUPERNOVA REMNANTS
G. Wallerstein, University of Washington, School of Arts & Sciences, Dept. of Astronomy, *Seattle, Washington* 98105 (NSG 5374)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

10.0034, GUEST INVESTIGATION OF THREE YOUNG SUPERNOVA REMNANTS
P.F. Winkler, Beloit College, Graduate School, *Beloit, Wisconsin* 53511 (NAS 8-33355)

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VOLUME 17 NUMBER 24 / DECEMBER 23, 1979

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N79-33152* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 113, SEPTEMBER 1979
Sep. 1979 127 p
(NASA-SP-7037(113)) Avail: NTIS HC E02 CSCL 01A

This bibliography lists 436 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1979. Author

N79-33153* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 111, JULY 1979
Jul. 1979 162 p
(NASA-SP-7037(111)) Avail: NTIS HC E02 CSCL 01A

This bibliography lists 570 reports, articles, and other documents introduced into the NASA scientific and technical information system in June 1979. Author

N79-33154# Perceptronics, Inc., Woodland Hills, Calif.
COMPARATIVE STUDIES OF ORGANIZATIONAL FACTORS, IN MILITARY MAINTENANCE Final Report
Kenneth L. Drake, William H. Crooks, and Russell N. Goto Jun. 1979 130 p refs
(Contract MDA903-77-C-0039; ARPA Order 3308)
(AD-A071608; PTR-1043-79-6) Avail: NTIS HC A07/MF A01 CSCL 01/3

This report describes the results of the second year effort of a two-year research program. The program was directed toward improving the capability of U.S. Army Aviation Maintenance Operations. The objectives of the overall program were to explore those organizational factors, emphasizing incentive structures, that influence aviation maintenance performance effectiveness and efficiency. The current effort was directed toward performing a demonstration study based on one of the initial year's recommendations, which included the finding that it may be more profitable to reduce existing disincentives rather than produce additional incentives. One such disincentive was that of inefficient manpower scheduling for non-maintenance activities. A new scheduling system was experimentally tested with an operational U.S. Army Aviation Maintenance installation using an Organization Development intervention strategy. This system was a work pool approach and involved utilizing a small segment of the work force to perform taskings on a team rotational basis. Successful results were obtained in two major areas: (1) the reduction in primary MOS job interruptions; and (2) increased manpower control for work station supervisors. GRA

N79-33155# General Accounting Office, Washington, D. C. Logistics and Communications Div.
IF ARMY HELICOPTER MAINTENANCE IS TO BE READY FOR WARTIME, IT MUST BE MADE EFFICIENT AND EFFECTIVE IN PEACETIME
10 May 1979 54 p
(PB-295300/8; LCD-79-407) Avail: NTIS HC A04/MF A01 CSCL 01C

The improvement of the Army's 8,000 helicopters depot maintenance was considered. The realistic requirements were discussed along with the appropriate resources needed to meet them. It was concluded that the Army should apply the reliability centered maintenance-concept forming as long as it is economic, safe, and reliable for engine components. Depot effectiveness could be further improved if the Army reduced concurrent rework of aircraft components and made greater use of batch processing. GRA

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N79-33156 Notre Dame Univ., Ind.
AN EXPERIMENTAL INVESTIGATION OF THE FLOW FIELD AROUND A BLUFF BODY IN A HIGHLY TURBULENT SHEAR FLOW Ph.D. Thesis
Charles Fiscina 1979 151 p
Avail: Univ. Microfilms Order No. 7919941

A high turbulence linear shear flow was generated in an atmospheric boundary layer simulation wind tunnel by a system of unevenly spaced horizontal rods placed well ahead of the test selection. Measurements made upstream of an infinite aspect ratio rectangular cylinder with an x-wire hot-wire probe revealed the deformation of the mean velocity profile caused by the presence of the model and were used to determine the effect of the model on the turbulence characteristics as well as its effect on the longitudinal length scales and one-dimensional spectra of the mean flow. Measurements made down stream of the model with a single sensor hot-wire probe to determine the vortex shedding pattern in the wake revealed the formation of cells of constant vortex shedding frequency along the body with transition regions from one cell to the next that were much larger than those found for low-turbulence shear flows.
Dissert. Abstr.

N79-33157 Pennsylvania Univ., Philadelphia.
INVISCID AERODYNAMIC PREDICTIONS FOR BALLISTIC REENTRY VEHICLES WITH ABLATED NOSETIPS Ph.D. Thesis
Darryl Wayne Hall 1979 189 p
Avail: Univ. Microfilms Order No. 7919463

A three-dimensional coordinate system that can automatically be closely aligned with the surface of an arbitrary nosetip shape results from a sequence of conformal transformations carried

independently in each meridional plane. A three-dimensional blunt body code was developed that is formulated in the new coordinate system. The steady solution is sought as the asymptotic limit of the time-dependent inviscid equations using an explicit second-order accurate fininite difference procedure. Two methods of treating embedded shocks were investigated: the conservation and the lambda differencing shock-capturing approaches. The ability of the new technique to treat ablated nosetip shapes for which inviscid flow calculations could not previously to obtained is demonstrated. In addition, the new nosetip code coupled to an inviscid supersonic afterbody code to permit the prediction of aerodynamic characteristics for entire reentry vehicles with ablated nosetips. Comparisons of the numerical predictions to wind tunnel data for these configurations show good agreement. Dissert. Abstr.

N79-33158 West Virginia Univ., Morgantown.
A FREE-VORTEX MODEL WITH NUMERICAL SOLUTION FOR THE UNSTEADY LIFTING CHARACTERISTICS OF STRAIGHT BLADED DARRIEUS WIND TURBINES Ph.D. Thesis
Paul Gerald Migliore 1979 295 p
Avail: Univ. Microfilms Order No. 7920716

A method was developed to analyze the flow and predict the lifting characteristics of vertical axis wind turbines. Blades are modelled by a number of discrete bound vortices located on the airfoil mean camber line; the wake is modelled by a number of discrete vortices shed from the blade trailing edge. Application of the flow tangency boundary condition and the Kutta condition permit a numerical solution for the strengths of the bound vortices. Blade forces are then determined from potential theory. This vortex model faithfully reflects the important phenomena of flow unsteadiness and wake/blade interaction. Wake details and energy extraction efficiency are analyzed for single and multi-bladed turbines. A comparison of experimental data to analytical predictions shows close agreement for the maximum power coefficient and the tip speed ratio at which at occurs.
Dissert. Abstr.

N79-33159*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
FLIGHT DETERMINED LIFT AND DRAG CHARACTERISTICS OF AN F-8 AIRPLANE MODIFIED WITH A SUPERCRITICAL WING WITH COMPARISON TO WIND-TUNNEL RESULTS
Jon S. Pyle and Louis L. Steers Jun. 1975 87 p
(NASA-TM-X-3250; H-843) Avail: NTIS HC A05/MF A01 CSCL 01A

Flight measurements obtained with a TF-8A airplane modified with a supercritical wing are presented for altitudes from 7.6 kilometers (25,000 feet) to 13.7 kilometers (45,000 feet), Mach numbers from 0.6 to 1.2, and Reynolds numbers from 0.8 x 10 to the 7th power to 2.3 x 10 to the 7th power. Flight results for the airplane with and without area-rule fuselage fairings are compared. The techniques used to determine the lift and drag characteristics of the airplane are discussed. Flight data are compared with wind-tunnel model results, where applicable. Author

N79-33160*# Boeing Commercial Airplane Co., Seattle, Wash.
DYLOFLEX MODIFICATIONS TO FLEXSTAB. VOLUME 2: USER'S MANUAL. VOLUME 3: PROGRAMMER'S MANUAL Contractor Report, May 1975 - May 1977
Patrick DAuria Oct. 1979 123 p
(Contract NAS1-13918)
(NASA-CR-2863; D6-44472-Vol-2) Avail: NTIS HC A06/MF A01 CSCL 01A

The changes made to the SD and SS program of the FLEXSTAB computer program system which allows it to be interfaced with the DYLOFLEX program system are described. The changes to specific pages in the FLEXSTAB user's manual are presented. The changes to specific pages in the FLEXSTAB programmer's manual are described. The changes were made for compatibility with the DYLOFLEX and were made in the 2.01 FLEXSTAB SD and SS program. A.W.H.

N79-33161*# Scientific Research Associates, Inc., Glastonbury, Conn.
A COMPRESSIBLE SOLUTION OF THE NAVIER-STOKES EQUATIONS FOR TURBULENT FLOW ABOUT AN AIRFOIL Progress Report
S. J. Shamroth and H. J. Gibeling Washington NASA Oct. 1979 67 p refs Sponsored in part by Army Research and Technology Labs.
(Contract NAS1-15214)
(NASA-CR-3183) Avail: NTIS HC A04/MF A01 CSCL 01A

A compressible time dependent solution of the Navier-Stokes equations including a transition turbulence model is obtained for the isolated airfoil flow field problem. The equations are solved by a consistently split linearized block implicit scheme. A nonorthogonal body-fitted coordinate system is used which has maximum resolution near the airfoil surface and in the region of the airfoil leading edge. The transition turbulence model is based upon the turbulence kinetic energy equation and predicts regions of laminar, transitional, and turbulent flow. Mean flow field and turbulence field results are presented for an NACA 0012 airfoil at zero and nonzero incidence angles of Reynolds number up to one million and low subsonic Mach numbers. J.M.S.

N79-33162*# Scientific Research Associates, Inc., Glastonbury, Conn.
A VISCOUS FLOW ANALYSIS FOR THE TIP VORTEX GENERATION PROCESS
S. J. Shamroth and W. R. Briley Washington NASA Oct. 1979 77 p refs
(Contract NAS1-14904)
(NASA-CR-3184) Avail: NTIS HC A05/MF A01 CSCL 01A

A three dimensional, forward-marching, viscous flow analysis is applied to the tip vortex generation problem. The equations include a streamwise momentum equation, a streamwise vorticity equation, a continuity equation, and a secondary flow stream function equation. The numerical method used combines a consistently split linearized scheme for parabolic equations with a scalar iterative ADI scheme for elliptic equations. The analysis is used to identify the source of the tip vortex generation process, as well as to obtain detailed flow results for a rectangular planform wing immersed in a high Reynolds number free stream at 6 degree incidence. Author

N79-33163*# Bihrle Applied Research, Inc., Jericho, N. Y.
ROTARY BALANCE DATA FOR A TYPICAL SINGLE-ENGINE GENERAL AVIATION DESIGN FOR AN ANGLE-OF-ATTACK RANGE OF 8 DEG TO 90 DEG. 2: LOW-WING MODEL B
William Bihrle, Jr. and Randy S. Hultberg Washington NASA Sep. 1979 345 p refs
(Contract NAS1-14849)
(NASA-CR-3098) Avail: NTIS HC A15/MF A01 CSCL 01A

Aerodynamic characteristics obtained in a rotational flow environment utilizing a rotary balance located in the spin tunnel are presented in plotted form for a 1/6.5 scale, single engine, low wing, general aviation airplane model. The configurations tested included the basic airplane, various wing leading-edge devices, tail designs, and rudder control settings as well as airplane components. Data are presented without analysis for an angle-of-attack range of 8 deg to 90 deg and clockwise and counter-clockwise rotations covering an (omega)(b)/2V range from 0 to 0.85. Author

N79-33164*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LONGITUDINAL AERODYNAMIC CHARACTERISTICS OF A VECTORED-ENGINE-OVER-WING CONFIGURATION AT SUBSONIC SPEEDS
Laurence D. Leavitt Oct. 1979 136 p refs
(NASA-TP-1533; L-13108) Avail: NTIS HC A07/MF A01 CSCL 01A

The Langley V/STOL tunnel was used to determine the effects of vectoring exhaust flow on the longitudinal aerodynamic characteristics of a vectored-engine-over-wing configuration. Vectoring was accomplished by blowing from over-wing-mounted engines over a variable trailing-edge flap. Effects of varying canard geometry and wing leading-edge geometry were investigated. Wind-tunnel data were obtained at a Mach number of 0.186 for an angle-of-attack range from -20 deg to 24 deg and engine

nozzle pressure ratios from 1.0 (jet off) to approximately 3.75.
A.R.H.

N79-33165*# Boeing Commercial Airplane Co., Seattle, Wash.
A COMPUTER PROGRAM TO GENERATE EQUATIONS OF MOTION MATRICES, L217 (EOM). VOLUME 1: ENGINEERING AND USAGE Final Report
R. I. Kroll and R. E. Clemmons Oct. 1979 161 p refs
(Contract NAS1-13918)
(NASA-CR-2851; D6-44460) Avail: NTIS HC A08/MF A01 CSCL 01A

The equations of motion program L217 formulates the matrix coefficients for a set of second order linear differential equations that describe the motion of an airplane relative to its level equilibrium flight condition. Aerodynamic data from FLEXSTAB or Doublet Lattice (L216) programs can be used to derive the equations for quasi-steady or full unsteady aerodynamics. The data manipulation and the matrix coefficient formulation are described. A.R.H.

N79-33166*# Boeing Commercial Airplane Co., Seattle, Wash.
A COMPUTER PROGRAM TO GENERATE EQUATIONS OF MOTION MATRICES, L217 (EOM). VOLUME 2: SUPPLEMENTAL SYSTEM DESIGN AND MAINTENANCE DOCUMENT Topical Report, May 1975 - May 1977
R. E. Clemmons and R. I. Kroll Washington NASA Oct. 1979 180 p refs
(Contract NAS1-13918)
(NASA-CR-2852; D6-44461-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 01A

The equations of motion program L217 (EOM) is described. The program formulates the matrix coefficients for a second order linear differential equation which describes the motion of an airplane relative to its level equilibrium flight condition. Aerodynamic data from FLEXSTAB or Doublet Lattice (L216) programs are used to derive the equations for quasi-steady or complete unsteady aerodynamics. A.W.H.

N79-33167*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WIND-TUNNEL INVESTIGATION OF A LARGE-SCALE VTOL AIRCRAFT MODEL WITH WING ROOT AND WING THRUST AUGMENTORS
Kiyoshi Aoyagi and Thomas N. Aiken Sep. 1979 60 p refs
(NASA-TM-78589; A-7823) Avail: NTIS HC A04/MF A01 CSCL 01A

Tests were conducted in the Ames 40 by 80 foot wind tunnel to determine the aerodynamic characteristics of a large-scale V/STOL aircraft model with thrust augmentors. The model had a double-delta wing of aspect ratio 1.65 with augmentors located in the wing root and the wing trailing edge. The supply air for the augmentor primary nozzles was provided by the YJ-97 turbojet engine. The airflow was apportioned approximately 74 percent to the wing root augmentor and 24 percent to wing augmentor. Results were obtained at several trailing-edge flap deflections with the nozzle jet-momentum coefficients ranging from 0 to 7.9. Three-component longitudinal data are presented with the agumentor operating with and without the horizontal tail. A limited amount of six component data are also presented. Author

N79-33168# Maryland Univ., College Park. Dept. of Aerospace Engineering.
INVESTIGATION OF TRANSONIC GAS FLOWS: ANALYTICAL AND NUMERICAL METHODS Final Report
Oleg Belotserkovskii Mar. 1979 73 p refs
(Contract N00014-79-M-0022)
(AD-A071419; AE-79-2) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report considers some problems of transonic gasdynamics related to the theory of planar and three-dimensional flows of a perfect gas which have been worked out mainly by the author and his collaborators. Results of analytical investigations of a number of exact properties of solutions which describe the flow around bodies with a detached shock, are presented without proof in the form of theorems (proofs are to be found in the papers cited). Results of numerical solutions obtained by the methods of integral relations and 'large particles', are presented for the complete problem of transonic flow around blunt bodies whose profiles possess sharp corners. The boundaries of distinct minimal domains of influence in mixed flow about blunt bodies are also examined. GRA

N79-33169# Air Force Armament Lab., Eglin AFB, Fla.
COMPARISON OF STORE AIRLOADS FROM 5.0 AND 7.5 PERCENT F-15 WIND TUNNEL TESTS Final Report, Sep. 1977 - Jun. 1978
Lawrence E. Lijewski Nov. 1978 76 p refs
(AD-A070919; AFATL-TR-78-135) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report compares 5.0 and 7.5 percent scale aerodynamic force and moment data from external stores on the F-15 aircraft. The data was obtained at Mach numbers 0.80, 0.95, 1.05, and 1.20. Angles of attack tested were -6, -4, -2, 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20 degrees with angles of sideslip -8, 0, -8 degrees. Data taking hysteresis effects are also explored, as well as inboard pylon to centerline pylon effects on the data. GRA

N79-33170# New Mexico Univ., Albuquerque. Technology Application Center.
BOUNDARY LAYER EQUATIONS. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1975 - May 1979
Gerald F. Zollars Jul. 1979 48 p Prepared in cooperation with NTIS
(NTIS/PS-79/0651/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

The 208 articles cited from the international literature cover applications and calculations of boundary layer equations. Equations for laminar boundary layers, for two dimensional and three dimensional boundary layers, compressible and incompressible boundary layers, and turbulent boundary layers are included. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N79-33171*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROCEDURES FOR ESTIMATING THE FREQUENCY OF COMMERCIAL AIRLINE FLIGHTS ENCOUNTERING HIGH CABIN OZONE LEVELS
James D. Holdeman Oct. 1979 56 p refs
(NASA-TP-1560; E-9991) Avail: NTIS HC A04/MF A01 CSCL 01C

Three analytical problems in estimating the frequency at which commercial airline flights will encounter high cabin ozone levels are formulated and solved: namely, estimating flight-segment mean levels, estimating maximum-per-flight levels, and estimating the maximum average level over a specified flight interval. For each problem, solution procedures are given for different levels of input information - from complete cabin ozone data, which provides a direct solution, to limited ozone information, such as ambient ozone means and standard deviations, with which several assumptions are necessary to obtain the required estimates. Each procedure is illustrated by an example case calculation that uses simultaneous cabin and ambient ozone data obtained by the NASA Global Atmospheric Sampling Program. Critical assumptions are discussed and evaluated, and the several solutions for each problem are compared. Example calculations are also performed to illustrate how variations in lattitude, altitude, season, retention ratio, flight duration, and cabin ozone limits affect the estimated probabilities. Author

N79-33172*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPARATIVE ANALYSIS OF PA-31-350 CHIEFTAIN

(N44LV) ACCIDENT AND NASA CRASH TEST DATA
Robert J. Hayduk Washington Oct. 1979 59 p refs
(NASA-TM-80102; L-13064) Avail: NTIS HC A04/MF A01 CSCL 01C

A full scale, controlled crash test to simulate the crash of a Piper PA-31-350 Chieftain airplane is described. Comparisons were performed between the simulated crash and the actual crash in order to assess seat and floor behavior, and to estimate the acceleration levels experienced in the craft at the time of impact. Photographs, acceleration histories, and the tested airplane crash data is used to augment the accident information to better define the crash conditions. Measured impact parameters are presented along with flight path velocity and angle in relation to the impact surface. A.W.H.

N79-33173# Douglas Aircraft Co., Inc., Long Beach, Calif.
HIGH SPEED BIRD IMPACT TESTING OF AIRCRAFT TRANSPARENCIES Final Report, Jul. 1975 - Jun. 1978
M. J. Coker and R. H. Magnusson Jun. 1978 254 p refs
(Contract F33615-75-C-3105; AF Proj. 2202)
(AD-A071814; MDC-J7184; AFFDL-TR-77-98) Avail: NTIS HC A12/MF A01 CSCL 01/3

This report documents the test plans, test results and analyses of a series of high speed bird impact tests conducted on the B-1 X-5 Module windshield and on 36 x 36 inch simulated windshield test specimens as a portion of the work accomplished for the 'Windshield Technology Demonstrator Pro'. The testing, analyses and development accomplished during this program involved a total system approach required for aircraft windshields in the context of the continuing Air Force generic windshield development programs. Tests were conducted to evaluate the bird impact resistance of glass and plastic windshield panels and associated supporting structure being considered for use in the B-1 aircraft. Strain and deflection measurements were made on the test panels and supporting structure on most of the tests. A description of the tests and results obtained are presented. GRA

N79-33174# National Technical Information Service, Springfield, Va.
BIRD STRIKES AND AVIATION SAFETY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jun. 1979
Guy E. Habercom, Jr. Jul. 1979 99 p Supersedes NTIS/PS-78/0694, NTIS/PS-77/0606, and NTIS/PS-76/0538
(NTIS/PS-79/0753/8; NTIS/PS-78/0694; NTIS/PS-77/0606; NTIS/PS-76/0538) Avail: NTIS HC $28.00/MF $28.00 CSCL 01B

Hazards to aircraft created by engine ingestion or airplane interception of birds are investigated in these Government-sponsored research reports. Bird damage assessment, structural strengthening, windshield design, and bird tracking and dispersal methods are studied. Ninety abstracts are included. GRA

N79-33175# National Technical Information Service, Springfield, Va.
SEARCH AND RESCUE METHODS AND EQUIPMENT. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jun. 1979
Edith Kenton Jul. 1979 239 p Supersedes NTIS/PS-78/0539; NTIS/PS-77/0498; and NTIS/PS-76/0285
(NTIS/PS-79/0649/8; NTIS/PS-78/0539; NTIS/PS-77/0498; NTIS/PS-76/0285) Avail: NTIS HC $28.00/MF $28.00 CSCL 06G

Reports dealing with maritime and aviation search and rescue are presented. Studies are included on search and rescue planning, locating equipment, rescue beacons, communication devices, specialized aircraft and their components, and searching strategies. Underwater rescue and survival are excluded. (This updated bibliography contains 232 abstracts, 36 of which are new entries to the previous edition.) GRA

N79-33176# National Transportation Safety Board, Washington, D. C. Bureau of Technology.
SINGLE ENGINE, FIXED WING GENERAL AVIATION ACCIDENTS Special Study, 1972 - 1976
31 May 1979 82 p
(PB-297216/4; NTSB-AA-79-1) Avail: NTIS HC A05/MF A01 CSCL 01B

The factors associated with 17,312 general aviation accidents which occurred from 1972 through 1976 involving 17,498 light, single-engine, fixed-wing aircraft were examined. These aircraft accounted for 81.0 percent of the accidents, 76.0 percent of the fatal accidents and 69.2 percent of the fatalities involving general aviation aircraft during that period. The factors considered include aircraft make, model, configuration -- such as tail wheel or tricycle landing gear and high- or low-wing configuration -- the pilot, and the environment. Certain aircraft makes, models, and characteristics were shown to be associated with high accident rates. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N79-33177*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AUTONOMOUS NAVIGATION SYSTEM Patent Application
Shmuel J. Merhav, inventor (to NASA) (National Research Council, Haifa, Israel) Filed 24 Sep. 1979 19 p Sponsored by NASA
(NASA-Case-ARC-11257-1; US-Patent-Appl-SN-078611) Avail: NTIS HC A02/MF A01 CSCL 17G

A low cost autonomous navigation system which disposes with accelerometers used in the conventional gimballed and strapdown inertial systems is described. The navigation system provides longitudinal and lateral vehicular specific force measurements in the locally level plane irrespective of the vehicle pitch, roll, and yaw motions. The navigation system provides longitudinal and lateral velocities in locally level geography coordinates along with vehicle position, altitude and attitude information. The system minimizes the number of sensors and system complexity, thus reducing errors, while providing a rapid method of north calibration. The system is composed of an unbalanced, pendulous, two axis gimbal system with a two degree of freedom leveling gyroscope and a heading gyroscope. A.W.H.

N79-33178# National Aviation Facilities Experimental Center, Atlantic City, N. J.
AIR TRAFFIC CONTROL/FULL BEACON COLLISION AVOIDANCE SYSTEM CHICAGO SIMULATION Final Report, Mar. - Apr. 1978
B. Billmann, T. Morgan, and R. Strack Apr. 1979 100 p refs
(FAA Proj. 052-241-310)
(AD-A069524; FAA-RD-79-16) Avail: NTIS HC A05/MF A01 CSCL 17/7

Air Traffic Control/Full Beacon Collision Avoidance System (ATC/BCAS) interaction in a high-density terminal area (featuring parallel instrument landing system (ILS) approaches) was investigated. Data are provided for a comparative study between BCAS and other aircraft collision avoidance systems. The tests were conducted using the Air Traffic Control Simulation Facility (ATCSF) at NAFEC during March and April 1978. Analysis of the results indicated that the presence of BCAS had no adverse impact on the controllers or control procedures because of a very low interaction rate. Controllers were generally indifferent to the use of the BCAS during the simulation. A significant number of controllers desired the displaying of negative commands. Certain changes in the BCAS logic are identified. Recommendations are made to investigate further desensitization techniques and further development of a multi-aircraft resolution logic, and to perform additional real-time simulation to assess the effect of profile descent procedures on BCAS alert rates. G.Y.

N79-33179# Lincoln Lab., Mass. Inst. of Tech., Lexington.
NEXT GENERATION AIRPORT SURVEILLANCE RADAR (ASR-()) DEFINITION STUDY Final Report, Oct. 1974 - Oct. 1975

Jun. 1979 121 p refs Prepared in cooperation with APL and MITRE Corp. Sponsored by FAA
(AD-A072691; FAA-RD-78-65) Avail: NTIS HC A06/MF A01 CSCL 17/7

The characteristics of the next generation airport surveillance radar (ASR) are investigated along with developed technology in airport radar utilization. The operational requirements of the ASR are defined including the coverage of small aircraft. The operating frequency, the antenna design, digital processing techniques, and a beacon system augmentation are examined. A.W.H.

N79-33180# Federal Aviation Administration, Washington, D. C. Systems Research and Development Service.
HELICOPTER AIR TRAFFIC CONTROL OPERATIONS Final Report
May 1979 113 p refs
(Contract DOT-FA78WAI-936)
(AD-A072793; FAA-RD-78-150; T-79-ES-06-U) Avail: NTIS HC A06/MF A01 CSCL 17/7

The problems which inhibit the integration of IFR operations in the ATC system were examined, and recommendations were made to resolve these problems. Revisions in TERPS criteria and in the ATC Handbook are necessary to minimize interference between fixed-wing and rotary-wing aircraft. The use of 2 nm radar separation between IFR helicopters in terminal areas is recommended to increase capacity by reducing the time interval between helicopter approaches to a value consistent with the time interval between fixed-wing approaches. Helicopters have a special need for low altitude RNAV capability and the ATC system needs to be better adapted to handle the random route traffic that helicopters will generate in exploiting their special capabilities. To this end, it is recommended that the FAA develop software to call up and display, on the ATC PPI, random waypoints and connecting routes, on an as-needed basis. Helicopters operating offshore and in remote areas are often beyond the coverage of surveillance radar, thus requiring the use of procedural control. They also operate below the coverage of VHF communications and VOR/DME, requiring alternate types of systems, several of which are recommended. Author

N79-33181# Federal Aviation Administration, Washington, D. C. Systems Research and Development Service.
OPERATIONAL EVALUATION OF AN OPTICAL INFRARED AIRBORNE PROXIMITY WARNING INDICATOR (APWI) Final Report
Ernest Lucier Dec. 1978 38 p
(AD-A073178; FAA-RD-78-153) Avail: NTIS HC A03/MF A01 CSCL 01/3

The results of an operational evaluation conducted between by general aviation pilots on an Airborne Proximity Warning Indicator (APWI) are summarized. The FAA conducted an operational evaluation of the APWI using four systems installed in general aviation aircraft. The evaluation produced results consisting of questionnaires completed by the general aviation pilots who flew the system. J.M.S.

N79-33182# Ambac Industries, Fort Washington, Pa.
AIRBORNE DETERMINATION OF GROUND SPEED: A FEASIBILITY STUDY Final Report, 28 Feb. 1978 - 28 Mar. 1979
Frank Greenwood Feb. 1979 41 p refs
(Contract DOT-FA78WA-4214)
(AD-A073193; FAA-RD-79-19) Avail: NTIS HC A03/MF A01 CSCL 01/2

To obtain the aircraft speed during instrument landing system approaches, an algorithm was developed which utilizes the glide slope deviation signal and the rate of descent, as determined from the radar or barometric altimeter. The accuracy of these inputs is determined from a study of all appropriate Federal Aviation Administration flight inspection records and from examination of topographic maps of the areas beneath the flights for which records were available. It was found that irregularities in the glide slope, variations in the slope of the terrain, and rapid fluctuations in the barometric pressure associated with wind shear will all induce excessive errors in the value obtained for the ground speed. Author

N79-33183# National Aviation Facilities Experimental Center, Atlantic City, N. J.
SIMULATION STUDY OF THE OPERATIONAL CHARACTERISTICS OF A TWO/THREE-DIMENSIONAL MULTIWAYPOINT AREA NAVIGATION (RNAV) SYSTEM Final Report, Jan. - Aug. 1977
Donald Eldredge, Warren G. Crook, B. Delano DeBaryshe, and William R. Crimbring Aug. 1979 190 p refs
(AD-A073204; FAA-RD-79-31; FAA-NA-78-46) Avail: NTIS HC A09/MF A01 CSCL 01/2

Pilot capability to fly air traffic control offsets and vertical profiles for both two and three-dimensional area navigation (RNAV) modes both with and without the use of a flight director was evaluated using simulation tests conducted at the National Aviation Facilities Experimental Center. Total system crosstrack error (TSCT) and flight technical error (FTE) were considered. Pilot performance was assessed on horizontal tracking, vertical tracking, and turns. The major findings were: (1) 2 sigma and 2 RMS steady state tracking data for centerline and offset tracking were within + or - 1.5 nautical miles of the course being flown, (2) summary data for centerline turns never exceeded a 2 nautical miles error range; (3) centerline tracking was less variable than offset tracking; (4) the use of 3D RNAV mode to arrive at a specified altitude at a specific location increased pilot workload along the route segment leading to that location, (5) lag times for pilot response to ATC RNAV clearances were found to be a function of the situation complexity; and (6) the calculated RSS statistic proved to be an overconservative estimator of TSCT errors. A.R.H.

N79-33184# Federal Aviation Administration, Washington, D. C.
THE SELECTION OF GLIDE SLOPE ANTENNA PATTERNS FOR USE IN THE FREQUENCY ASSIGNMENT PROCESS Final Report
Mark Lopez Jul. 1979 91 p
(AD-A073176; FAA-RD-79-75) Avail: NTIS HC A05/MF A01 CSCL 01/2

Horizontal antenna patterns for glide slope antennas are presented for consideration in the frequency assignment process. Emphasis is placed on the separation required between glide slope frequency assignments. For each antenna type, a particular antenna pattern is recommended. J.M.S.

N79-33185*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTIPLE SPEED EXPANDABLE BIT SYNCHRONIZER
James M. Bundinger Aug. 1979 13 p refs
(NASA-TM-79262; E-176) Avail: NTIS HC A02/MF A01 CSCL 17G

A multiple speed bit synchronizer was designed for installation in an inertial navigation system data decoder to extract non-return-to-zero level data and clock signal from biphase level data. The circuit automatically senses one of four pre-determined biphase data rates and synchronizes the proper clock rate to the data. Through a simple expansion of the basic design, synchronization of more than four binarily related data rates can be accomplished. The design provides an easily adaptable, low cost, low power alternative to external bit synchronizers with additional savings in size and weight. A.R.H.

N79-33186# National Technical Information Service, Springfield, Va.
MICROWAVE LANDING SYSTEMS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jun. 1979
William E. Reed Aug. 1979 187 p Supersedes NTIS/PS-78/0731; NTIS/PS-77/0617; NTIS/PS-76/0555; and NTIS/PS-75/417 2 Vol.
(NTIS/PS-79/0777/7; NTIS/PS-78/0731; NTIS/PS-77/0617; NTIS/PS-76/0555; NTIS/PS-75/417) Avail: NTIS HC $28.00/MF $28.00 CSCL 17G

Federally-sponsored research on the planning, development, and operation of aircraft microwave landing systems is presented. Studies include feasibility, systems engineering, equipment, signal propagation, and cost analysis. This updated bibliography contains 181 abstracts, 35 of which are new entries to the previous edition. GRA

N79-33187# National Technical Information Service, Springfield, Va.
MICROWAVE LANDING SYSTEMS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jun. 1979
William E. Reed Aug. 1979 106 p Supersedes NTIS/PS-78/0732; NTIS/PS-77/0618; and NTIS/PS-76/0556 2 Vol.
(NTIS/PS-79/0778/5; NTIS/PS-78/0732; NTIS/PS-77/0618; NTIS/PS-76/0556) Avail: NTIS HC $28.00/MF $28.00 CSCL 17G

The bibliography cites reports from worldwide research on the planning, development, and operation of microwave landing systems, including feasibility, systems engineering, equipment, signal propagation, and cost analysis. This updated bibliography contains 100 abstracts, 11 of which are new entries to the previous edition. GRA

N79-33188# National Technical Information Service, Springfield, Va.
AIR TRAFFIC CONGESTION AND CAPACITY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - May 1979
Guy E. Habercom, Jr. Jun. 1979 178 p Supersedes NTIS/PS-78/0598, NTIS/PS-77/0567, NTIS/PS-76/0495, and NTIS/PS-75/0376
(NTIS/PS-79/0594/6; NTIS/PS-78/0598; NTIS/PS-77/0567; NTIS/PS-76/0495; NTIS/PS-75/0376) Avail: NTIS HC $28.00/MF $28.00 CSCL 01E

Present and predicted air traffic density and capacity, both enroute and in airport environments, are analyzed. Terminal area scheduling, runway queueing, and airspace regulation are discussed. This updated bibliography contains 172 abstracts, 13 of which are new entries to the previous edition. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.
For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N79-33189*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF IMAGE TILT OF A VIRTUAL IMAGE DISPLAY ON SIMULATED TRANSPORT TOUCHDOWN PERFORMANCE
Russell V. Parrish, William M. Kahlraum, Jr., and George G. Steinmetz Washington Oct. 1979 17 p refs
(NASA-TP-1520; L-13087) Avail: NTIS HC A02/MF A01 CSCL 01C

An evaluation of the visual effect of image tilt of a refractive lens display system is presented. The system was used to present a rudimentary computer generated out the window scene to the pilot of a flight simulator during approach, flare, and touchdown. Comparisons are made of sink rate at touchdown and performances for untilted and tilted displays. Sixty four landings with each condition for a total of 128 touchdowns were made by 3 subjects. Performance measures, such as the flare and touchdown footprints, were recorded and analyzed. The visual effect of the image tilt was investigated for a terrain model board scene. A.W.H.

N79-33190# Aeronautical Research Labs., Melbourne (Australia).
LOAD SPECTRUM MEASURING EQUIPMENT. PART 2: DETAILS OF MK 2 SYSTEM USED TO ACQUIRE TORQUE LOAD DATA IN SEA KING HELICOPTERS
K. F. Fraser and U. R. Krieser Sep. 1978 55 p refs
(ARL/MECH-ENG-Note-372; AR-001-303) Avail: NTIS HC A04/MF A01

Measuring equipment which uses a set of electromechanical counters to indicate either the integrated time in seconds for which torque loading on a transmission component falls within each of a number of bands or the number of times each of a number of torque-bands is traversed, is described. Separation of the torque level into bands is made possible using a single transducer, an amplifier with zero and gain adjustments for setting the extremes of the torque range of interest, an analog to digital converter and decoder to separate the torque range into bands and counters to totalize the contributions relevant to each band. Author

N79-33191*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
PROCESSING OF ON-BOARD RECORDED DATA FOR QUICK ANALYSIS OF AIRCRAFT PERFORMANCE
Norman H. Michaud Sep. 1979 326 p
(NASA-RP-1043) Avail: NTIS HC A15/MF A01 CSCL 01C

A system of independent computer programs for the processing of digitized pulse code modulated (PCM) and frequency modulated (FM) data is described. Information is stored in a set of random files and accessed to produce both statistical and graphical output. The software system is designed primarily to present these reports within a twenty-four hour period for quick analysis of the helicopter's performance. A.R.H.

N79-33192# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
A-10 STATIC STRUCTURAL TEST PROGRAM Final Report
Thomas F. Hughes, Martin D. Richardson, and Frederick E. Hussong Feb. 1979 94 p refs
(AF Proj. 329A)
(AD-A071782; AFFDL-TR-79-3014) Avail: NTIS HC A05/MF A01 CSCL 20/11

The Fairchild Republic Company A-10 aircraft was subjected to a complete static structural test program covering all the critical flight, landing, and ground handling conditions. There were 79 separate test conditions in this test program. Four of these conditions were selected to be run as failing loads tests at the conclusion of the test program. There were no major structural failures of the primary structure. There were some failures and design deficiencies in secondary structure. GRA

N79-33193# Indianapolis Center for Advanced Research, Ind. Fluid Dynamics Labs.
COMPRESSOR RESEARCH FACILITY AERODYNAMICS ANALYSIS Final Technical Report, Oct. 1974 - Jul. 1978
G. David Huffman Apr. 1979 379 p refs
(Contract F33615-75-C-2008; AF Proj. 3066)
(AD-A070623; FDL-78-005; AFAPL-TR-79-2021) Avail: NTIS HC A17/MF A01 CSCL 21/5

This report documents a series of aerodynamic studies carried out jointly by AFAPL and ICFAR personnel in support of the design and development of the AF Aero Propulsion Laboratory Compressor Research Facility (CRF). The CRF is a non-return compressor test facility with air extracted from the atmosphere, compressed and then discharged to the atmosphere. In order to reduce compressor power requirements and simulate flight conditions at elevated altitudes, the compressor is mounted in a large tank or text chamber. The tank pressure is regulated with control valves with the compressor itself supplying the exhauster capability. The mass flow rate is measured downstream of the compressor using a series of venturis. The CRF utilizes automated data handling procedures and is capable of simulating some compressor transients. A pilot program utilizing an existing J-85 engine test facility at AFAPL was initiated to explore and develop the measurement technology required in transient compressor testing. GRA

N79-33194# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
ARMY AIRCRAFT FIRE CONTROL SYSTEMS PERFORMANCE EVALUATION Final Report
1 Jun. 1979 79 p refs
(AD-A070758; TOP-7-1-006) Avail: NTIS HC A05/MF A01 CSCL 19/5

This TOP provides an overview of the testing required for evaluation of the performance or effectiveness of modern Army aircraft weapon systems. A chart of test inputs to an aircraft armament system effectiveness evaluation is provided. Test and analysis procedures for accuracy and dispersion inputs are presented in detail. GRA

N79-33195# Textron Bell Helicopter, Fort Worth, Tex.
FLIGHT TEST EVALUATION OF THE HIGH INERTIA ROTOR SYSTEM Final Report, 21 Sep. 1976 - 1 Feb. 1979
L. W. Dooley and R. D. Yeary Jun. 1979 119 p refs
(Contract DAAJ02-76-C-0064)
(AD-A071648; USARTL-TR-79-9) Avail: NTIS
HC A06/MF A01 CSCL 01/3

The objectives of this program were to document the reduction in height-velocity restrictions for autorotational landings, the increased transient performance and maneuver capability using modified flight techniques, and the handling qualities of a modified OH-58A helicopter with a High Energy Rotor System (HERS). The rotor incorporated increased chord blades and provision for three different tip weights resulting in Lock number variations of 2.61, 3.14, and 5.43. GRA

N79-33196# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION OH-58C HELICOPTER Final Report
George M. Yamakawa, Robert M. Buckanin, John F. Hagen, and Thomas E. Burch Mar. 1978 80 p refs
(AD-A071699; USAAEFA-76-11-1) Avail: NTIS
HC A05/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a Preliminary Airworthiness Evaluation of the OH-58C helicopter from 21 February through 4 March 1978 at Arlington, Texas. Eighteen flights consisting of 14.7 hours of productive flight test time were flown while conducting a limited handling qualities evaluation of the aircraft. Testing was conducted primarily at maximum gross weight (3200 pounds) and aft center of gravity (fuselage station 112) conditions. The possibility of inadvertent activation of the night vision goggle switch located on the pilot cyclic control grip was identified as a deficiency. Activation of this switch during day flight rendered the warning and caution lights unreadable. The most significant difference in flying qualities between the OH-58C and the OH-58A was pitch-up tendency at cruise airspeed and aft center of gravity, which is a shortcoming. Insufficient left directional control in right sideward flight, excessive yaw oscillations in left sideward flight between 15 and 39 knots true airspeed, and excessive pitch and yaw oscillations in rearward flight are also shortcomings. Eight additional shortcomings were noted. GRA

N79-33197# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
LIMITED AIRWORTHINESS AND FLIGHT CHARACTERISTICS EVALUATION MODEL 214A HELICOPTER WITH FIBERGLASS MAIN ROTOR BLADES Final Report, 29 Aug. - 13 Oct. 1978
Jerry R. Guin, Robert D. Robbins, Gary L. Bender, and Edward E. Bailes May 1979 95 p refs
(AD-A071721; USAAEFA-77-32) Avail: NTIS
HC A05/MF A01 CSCL 01/3

Thirty-six test flights for a total of 20.4 productive flight hours were accomplished. Within the scope of this evaluation, the Model 214A helicopter with the fiberglass main rotor blades exhibited slightly improved hover and level flight performance at higher gross weight-altitude combinations. The handling qualities remain essentially unchanged from those exhibited by the Model 214A helicopter with standard rotor blades. The enhancing characteristic noted was the low level-flight vibration levels. The deficiency noted was the inadequate directional control at airspeeds greater than 15 KTAS in right sideward flight at high gross weight, density altitude combinations, which is not attributable to the fiberglass rotor installation. GRA

N79-33198# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
PRELIMINARY AIRWORTHINESS EVALUATION AH-1S HELICOPTER INSTALLED WITH ENHANCED COBRA ARMAMENT SYSTEM (AH-1S/ECAS) Final Report, Jul. - Aug. 1978
Patrick J. Moe, Robert Williams, Raymond B. Smith, and Ralph Woratschek Feb. 1979 138 p refs
(AD-A071343; USAAEFA-78-03) Avail: NTIS
HC A07/MF A01 CSCL 01/3

The United States Army Aviation Engineering Flight Activity conducted a preliminary airworthiness evaluation of the Enhanced Cobra Armament System (ECAS) with the universal turret subsystem and M-197 20mm gun installed. The purpose of the test was to evaluate the effects of turret installation and weapons firing on the helicopter. Additionally, a limited stability and control evaluation of the helicopter (gun stowed) was conducted. Flight testing was performed at Yuma Proving Grounds, Arizona, and consisted of 27 flight test hours (15 productive). GRA

N79-33199# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
SKIN AND SPAR INTERFACE PROGRAM (SASIP) Final Technical Report, 20 Jun. 1975 - 29 Sep. 1978
Allen Gonsiska and Richard T. Achard May 1979 131 p refs
(AF Proj. 2401)
(AD-A071715; AFFDL-TR-79-3054) Avail: NTIS
HC A07/MF A01 CSCL 01/3

This program had two basic goals. First was the investigation of the effects of fuel pressure (flatwise tension) loads and chordwise (transverse tension) loads on several integral composite skin/spar concepts. The second goal was the development of suitable tooling which could be used to produce these types of structural components. Several concepts were designed, produced, and tested under the required loading conditions. Results indicated that (a) integral composite skin/spar concepts could be manufactured using hard auto-clave tooling or elastomeric tooling and (b) concepts could be designed to carry the required loads, provided some type of coupling device is used to help distribute the loads from the spar to the skin. GRA

N79-33200# Army Research and Technology Labs., Fort Eustis, Va.
EVALUATION OF LIGHTWEIGHT, COMPOSITE, IMPACT-RESISTANT TAIL ROTOR DRIVE SHAFTING FOR HELICOPTERS Technical Note, Jul. 1973 - Dec. 1974
Edward H. Dean May 1979 40 p refs
(AD-A071034; USARTL-TN-34) Avail: NTIS
HC A03/MF A01 CSCL 01/3

Three contractors, Whittaker Corporation, Lockheed-California Company, and Fiber Science Incorporated, each designed and fabricated five samples of a lightweight, composite, impact-resistant tail rotor drive shaft. The shaft specimens were proof tested by the contractors, and ATL performed evaluation testing. Test results indicated that both sandwich-wall and wet-filament-wound drive shafts exceeded stated design requirements, and that production of high quality composite drive shafts is feasible. The majority of test failures occurred in shaft end fittings, indicative that additional research and development effort is needed in end fitting design. GRA

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N79-33201*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A REVIEW OF SOME HEAD-UP DISPLAY FORMATS
J. M. Naish (NAS-NRC) Oct. 1979 51 p refs
(NASA-TP-1499; A-7708; HUD-4) Avail: NTIS
HC A04/MF A01 CSCL 01D

Two alternate head-up display devices (HUD) were compared for properties relevant to the accurate performance of concurrent tasks in real flight conditions and in various flight modes. The comparisons were made to find the disorientation resistance of the HUDs along with the tracking accuracy, interference resistance, fixation resistance, and error resistance. The use of displacement and flight path information for vertical control is discussed in terms of flight stability. Several combinations of symbols and driving signals are described, including a compensated control law, which were used in simulated flight to deal with wind shear. A.W.H.

N79-33202# Dynamics Research Corp., Wilmington, Mass.
DIGITAL AVIONICS INFORMATION SYSTEM (DAIS): TRAINING REQUIREMENTS ANALYSIS MODEL (TRAMOD), VOLUME 1 Final Report, Dec. 1977 - May 1978
Andrew J. Czuchry, Kristy M. Doyle, Jonahan T. Frueh, H. Anthony Baran, and Ducan L. Dieterly Apr. 1979 69 p refs
(Contract F33615-75-C-5218)
(AD-A068474; AFHRL-TR-78-58-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 05/9

The training requirements analysis model (TRAMOD) described in this report represents an important portion of the larger effort called the Digital Avionics Information System (DAIS) Life Cycle Cost (LCC) Study. TRAMOD is the second of three models that comprise a LCC impact modeling system for use in the early states of system development. As part of the overall modeling system, the training model is an efficient tool for developing training programs on the basis of task, time, and resource criteria. This report explains the approach used in developing this model and its analytic value as a method for determining training requirements. Also, the methodology used to develop the task-related characteristic data necessary for its application to the DAIS are addressed. The model is described by explaining the techniques and algorithms used to accomplish its function. The interactive nature of TRAMOD affords the user great flexibility in structuring its operation while retaining the capability of addressing specific training problems in depth. This report explains the basis for available options. The Users Guide, Volume II, presents these options and illustrates the manner in which user/model interaction is accomplished. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-33203 North Carolina State Univ. at Raleigh.
AN EXPERIMENTAL STUDY OF THE RESPONSE OF A TURBOMACHINE ROTOR TO A LOW FREQUENCY INLET DISTORTION Ph.D. Thesis
Larry Warren Hardin 1979 160 p
Avail: Univ. Microfilms Order No. 7923049

An experiment was conducted to measure the response of an isolated turbomachine rotor to a distortion in inlet axial velocity. A once-per-revolution sinusoidal variation in axial velocity with an amplitude of approximately twenty percent of the average axial velocity was generated by an upstream screen. The response of the rotor was studied using pressure transducers and skin friction gages mounted on one of the rotor blades and a velocity probe at the rotor exit plane as well as with standard stationary frame pneumatic instrumentation. Dissert. Abstr.

N79-33204*# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
LAMINATED TURBINE VANE DESIGN AND FABRICATION Final Report, 20 Dec. 1976 - 20 Mar. 1979
W. G. Hess 19 Oct. 1979 70 p refs
(Contract NAS3-20587)
(NASA-CR-159655; FR-11662) Avail: NTIS HC A04/MF A01 CSCL 21E

A turbine vane and associated endwalls designed for advanced gas turbine engine conditions are described. The vane design combines the methods of convection cooling and selective areas of full coverage film cooling. The film cooling technique is utilized on the leading edge, pressure side, and endwall regions. The turbine vane involves the fabrication of airfoils from a stack of laminates with cooling passages photoetched on the surface. Cold flow calibration tests, a thermal analysis, and a stress analysis were performed on the turbine vanes. A.W.H.

N79-33205*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
ANALYTICAL EVALUATION OF THE IMPACT OF BROAD SPECIFICATION FUELS ON HIGH BYPASS TURBOFAN ENGINE COMBUSTORS Final Report
J. R. Taylor Aug. 1979 75 p refs
(Contract NAS3-20799)
(NASA-CR-159641; R79AEG504) Avail: NTIS HC A04/MF A01 CSCL 21E

Six conceptual combustor designs for the CF6-50 high bypass turbofan engine and six conceptual combustor designs for the NASA/GE E3 high bypass turbofan engine were analyzed to provide an assessment of the major problems anticipated in using broad specification fuels in these aircraft engine combustion systems. Each of the conceptual combustor designs, which are representative of both state-of-the-art and advanced state-of-the-art combustion systems, was analyzed to estimate combustor performance, durability, and pollutant emissions when using commercial Jet A aviation fuel and when using experimental referee board specification fuel. Results indicate that lean burning, low emissions double annular combustor concepts can accommodate a wide range of fuel properties without a serious deterioration of performance or durability. However, rich burning, single annular concepts would be less tolerant to a relaxation of fuel properties. As the fuel specifications are relaxed, autoignition delay time becomes much smaller which presents a serious design and development problem for premixing-prevaporizing combustion system concepts. A.R.H.

N79-33206*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
CF6 JET ENGINE PERFORMANCE IMPROVEMENT PROGRAM. SHORT CORE EXHAUST NOZZLE PERFORMANCE IMPROVEMENT CONCEPT
W. A. Fasching Sep. 1979 113 p refs
(Contract NAS3-20629)
(NASA-CR-159564) Avail: NTIS HC A06/MF A01 CSCL 21E

The short core exhaust nozzle was evaluated in CF6-50 engine ground tests including performance, acoustic, and endurance tests. The test results verified the performance predictions from scale model tests. The short core exhaust nozzle provides an internal cruise sfc reduction of 0.9 percent without an increase in engine noise. The nozzle hardware successfully completed 1000 flight cycles of endurance testing without any signs of distress. Author

N79-33207*# Lockheed-California Co., Burbank.
STUDY OF THE APPLICATION OF HYDROGEN FUEL TO LONG-RANGE SUBSONIC TRANSPORT AIRCRAFT. VOLUME 1: SUMMARY Final Report
G. D. Brewer, R. E. Morris, R. H. Lange, and J. W. Moore Jan. 1975 56 p refs For vol. 2 see N75-30163
(Contract NAS1-12972)
(NASA-CR-132558; LR-26752-1) Avail: NTIS HC A04/MF A01 CSCL 21E

The feasibility of using liquid hydrogen as fuel in advanced designs of long range, subsonic transport aircraft is assessed. Both passenger and cargo type aircraft are investigated. Comparisons of physical, performance, and economic parameters of the LH2 fueled designs with conventionally fueled aircraft are presented. Design studies are conducted to determine appropriate characteristics for the hydrogen related systems required on board the aircraft. These studies included consideration of material, structural, and thermodynamic requirements of the cryogenic fuel tanks and fuel systems with the structural support and thermal protection systems. A.W.H.

N79-33208# IIT Research Inst., Chicago, Ill.
TURBINE ENGINE PARTICULATE EMISSION CHARACTERIZATION Final Report, 10 Jun. 1978 - 31 Dec. 1979
John D. Stockham, Erdmann H. Luebicke, Donald L. Fenton (New Mexico State Univ., Las Cruces), Ralph H. Johnson (United Airlines, San Francisco), and Paul P. Campbell (United Airlines, San Francisco) Jan. 1979 129 p refs
(Contract DOT-FA75WA-3123)
(AD-A073198; FAA-RD-79-15) Avail: NTIS HC A06/MF A01 CSCL 21/5

Particulate emissions from the TF-30, JT8D, and JT9D aircraft turbine engines were characterized for mass emission rate, particle size distribution, particle shape, and elemental composition as a function of engine type, fuel type, and power setting. Samples were collected from the exhast plane of the engines with a sampling system developed under the contract. Two fuels were examined, Jet A and Pearl Kerosene. At idle power the TF-30 emitted 3.13 grams of particulate matter per kg of fuel consumed; the JT8D engine averaged 0.79 g/kg; no JT9D engine point was obtained. At takeoff power the TF-30 emitted 6.90 g/kg; the JT8D, 0.59 g/kg; and the JT9D, 0.38 g/kg. Geometric mean particle sizes ranged from 0.043 mm to 0.097 mm with particle size related to power level. Pearl Kerosene generally gave lower emissions and smaller particles than Jet A fuel. No elements were detected and it is assumed the particles are essentially carbon. Particle shape was difficult to quantify but the trend is for particle structure to be more complex or agglomerated at the higher power levels. Author

N79-33209*# AiResearch Mfg. Co., Torrance, Calif.
THERMAL-STRUCTURED DESIGN STUDY OF AN AIRFRAME-INTEGRATED SCRAMJET Final Report, Jun. 1975 - Dec. 1978
O. A. Buchmann Oct. 1979 38 p refs
(Contract NAS1-13984)
(NASA-CR-3141; AiResearch-78-15442-1) Avail: NTIS HC A03/MF A01 CSCL 21E

Design concepts for the cooled structures assembly for the Langley Scramjet engine, for engine subsystems, and for the aircraft/engine interface were developed and evaluated. Results show that the objectives for the Scramjet engine can be met. A thermal protection system was defined that makes it possible to attain a life of 100 hours and 1000 cycles, which is the specified goal. With stoichiometric combustion, the fuel provides an adequate heat sink for cooling the engine at Mach numbers up to 9 at the minimum fuel flow condition. The mechanical design is feasible for manufacture using conventional materials. For the cooled structures in a six-module engine, the mass per unit capture area is 1328 kg/sq m (259 lb/sq ft). The total mass of a six-module engine assembly including the fuel system is 1577 kg (3477 lb). A.R.H.

N79-33210*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF DIFFUSION FACTOR, ASPECT RATIO AND SOLIDITY ON OVERALL PERFORMANCE OF 14 COMPRESSOR MIDDLE STAGES
Werner R. Britsch, Walter M. Osborn, and Mark R. Laessig Washington Sep. 1979 148 p
(NASA-TP-1523; E-9943) Avail: NTIS HC A07/MF A01 CSCL 21E

A series of high hub tip radius ratio compressor stages representative of the middle and latter stages of axial flow compressors is discussed. The effects of aspect ratio, diffusion factor, and solidity on rotor and stage performance are determined. Fourteen middle stages are tested to study the effects on performance of varying both diffusion through the rotor and stator blades and blade aspect ratio. The design parameters in the streamline analysis program, the blade geometry program, and the blade coordinate program are presented. A.W.H.

N79-33211# Monsanto Research Corp., Dayton, Ohio.
RECLAMATION OF SYNTHETIC TURBINE ENGINE OIL MIXTURES Final Report, 15 Mar. 1976 - 15 Mar. 1978
Gerald Glasgow and Richard J. Bruns Apr. 1979 179 p refs
(Contract F33615-76-C-2037; AF Proj. 3048)
(AD-A071813; MRC-DA-780; AFAPL-TR-78-50) Avail: NTIS HC A09/MF A01 CSCL 11/8

The objective of this program was to develop a technique for reclaiming used synthetic turbine engine oil mixtures and to demonstrate the technical feasibility of the developed reclamation technique by restoring a limited number of used MIL-L-7808 oils to a satisfactory performance level. Reclamation process studies based on approaches utilized by the natural oil and fat refining industry resulted in the development of a reclamation process applicable to synthetic ester turbine engine oils. The components of a reclamation process applicable to a broad range of used MIL 7808G oil mixtures were defined and the technical feasibility established by reclamation and evaluation (via qualification tests) of two batches of used oils. Recommendations for improvement and refinement of the process and approaches to more extensive documentation of its viability were made. GRA

N79-33212# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
FOREIGN OBJECT IMPACT DESIGN CRITERIA Interim Technical Report, 19 Sep. - 31 Dec. 1977
Albert F. Storace Oct. 1978 29 p refs
(Contract F33615-77-C-5221; AF Proj. 3066)
(AD-A071169; R78AEG180; AFAPL-TR-78-81) Avail: NTIS HC A02/MF A01 CSCL 21/5

The program objective is to develop and validate structural design criteria that account for the transient overloads by bird and ice impacts on turbine engine first-stage fan/compressor blades. A design system structure was completed. Work was started on development of transient response models and impact loading models. Tests and analyses to be used to generate local leading edge damage design data were defined. Planning was initiated for gross structural damage investigations and structural element tests. Formulations of a matrix for parametric analysis was started. Three first stage blades were selected for modeling and testing. GRA

N79-33213# Detroit Diesel Allison, Indianapolis, Ind.
REGRESSION SIMULATION OF TURBINE ENGINE PERFORMANCE (RSTEP), TASK 1 Final Report, Sep. 1977 - Feb. 1979
Richard A. Sulkoske and Robert E. Clark Mar. 1979 62 p
(Contract F33615-77-C-2071; AF Proj. 3066)
(AD-A071400; DDA-EDR-9710; AFAPL-TR-79-2013) Avail: NTIS HC A04/MF A01 CSCL 20/5

The results of developing six alternate calculation procedures for parametric turbine engine performance computer programs are presented. The alternate procedures were evaluated separately and then collectively in a baseline parametric engine performance program. The alternate procedures dealt with thermodynamic properties, matrix coefficient prediction, regression of component characteristics, afterburner calculations and regression of the compression process. Analysis of the combined procedures resulted in a cost reduction of approximately 46 percent with average deviations in engine net thrust and fuel flow rate of less than 0.7 percent. GRA

N79-33214# Norton Co., Worcester, Mass. Industrial Ceramics Div.
INVESTIGATION OF THE USE OF CERAMIC MATERIAL IN AIRCRAFT ENGINE BEARINGS Final Report, 14 Jun. 1976 - 19 Dec. 1978
John W. Lucek and Paul E. Cowley (Federal Mogul Corp., Ann Arbor, Mich.) Jun. 1979 57 p refs
(Contract N00019-76-C-0251)
(AD-A070631) Avail: NTIS HC A04/MF A01 CSCL 13/9

A program to initiate life factor correlation between hot-pressed silicon nitride rolling elements and M-50 steel hybrid rolling elements has been completed. All materials for component fabrication have been procured and qualified. Retainers and test tooling are complete. Complications in rolling contact fatigue qualification of roller stock, traced to specimen preparation techniques did not allow completion of bearing fabrication. A considerable effort was dedicated to study of the RCF qualification for ceramic materials resulting in development of machining techniques to produce bearing quality silicon nitride surfaces without super-finishining. Static Hertzian indentation of silicon nitride surfaces, fracture energy measurements, and radioactive gas penetrant tracers were found to be potentially valuable evaluation techniques for ceramics in the rolling contact environment. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N79-33215 California Inst. of Tech., Pasadena.
OPTIMAL CONTROLLER DESIGN METHODS FOR LINEAR

SYSTEMS WITH UNCERTAIN PARAMETERS-DEVELOPMENT, EVALUATION, AND COMPARISON Ph.D. Thesis
Aharon Pesach Vinkler 1979 96 p
Avail: Univ. Microfilms Order No. 7919856

The multistep guaranteed cost control method and the minimum discrete expected cost method are discussed. The former is based on the concept of minimizing an upper bound of a cost functional in the face of parameter uncertainty. An algorithm was developed to analyze the effect of parameter uncertainties on closed-loop system stability. The minimum discrete expected cost method is based on the concept of minimizing the expected value of a cost functional over a finite number of points in the range of parameter uncertainty. The design process makes use of statistical information about the uncertain parameters and incorporates in its cost functional whatever effects accompany a large departure in the plant parameters from their nominal values. These two methods together with the guaranted cost control method, the minimax method, and the uncertainty weighting method, are compared in the context of the design of a fifth-order lateral autopilot for an RPV with uncertain aerodynamic coefficients. Dissert. Abstr.

N79-33216*# Naval Academy, Annapolis, Md.
WIND TUNNEL INVESTIGATION OF THE FREE-WING/FREE TRIMMER CONCEPT Status Report, Jan. - Oct. 1979
Doral R. Sandlin Oct. 1979 59 p refs
(Grant NsG-4020)
(NASA-CR-162351) Avail: NTIS HC A04/MF A01 CSCL 01C

The conclusions arrived at in this investigation are: (1) the free-wing/free-trimmer configuration is a viable concept, and exhibited both static and dynamic stability for a trimmer pivot at the 10 percent chord position; (2) unless properly controlled, friction in the mounting system and instrumentation can significantly affect the panel response; and (3) for the configurations tested, the control was far too sensitive, giving the full range of wing angle-of-attack for trimmer flap displacements of only a few degrees. M.M.M.

N79-33217*# Lockheed-California Co., Burbank.
ACCELERATED DEVELOPMENT AND FLIGHT EVALUATION OF ACTIVE CONTROLS CONCEPTS FOR SUBSONIC TRANSPORT AIRCRAFT
Oct. 1979 62 p refs
(Contract NAS1-14690)
(NASA-CR-159148; LR-29111) Avail: NTIS HC A04/MF A01 CSCL 01C

The flight test of an active load alleviation/extended span for the L-1011 wide-body transport aircraft, and piloted simulation work leading to use of active stability augmentation with a small tail and aft center of gravity are reported. The extended span showed the expected cruise drag reduction of 3%. The small tail is expected to reduce cruise drag by another 3%, and eventual use of more aft center of garvity with active stability augmentation will provide further fuel savings. The active load alleviation functions included maneuver load control (MLC) and elastic mode suppression (EMS), using symmetric motions of the outboard ailerons to reduce wing bending loads in maneuvers or long-term up- or down-drafts (MLC), and to damp wing bending motions in turbulence (EMS). A gust load alleviation function using the active horizontal tail to provide airplane pitch damping in turbulence was found unnecessary. The piloted simulation tests evaluated criteria for augmentation-on and augmentation-off flying qualities, of a simple pitch control law was verified at neutral static margin. The simulation tasks established the basis for follow-on construction and flight testing of a small tail with active stability augmentation. A.R.H.

N79-33218*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FIXED-BASE SIMULATION STUDY OF DECOUPLED LONGITUDINAL CONTROLS DURING APPROACH AND LANDING OF A MEDIUM JET TRANSPORT IN THE PRESENCE OF WIND SHEAR
G. Kimball Miller, Jr. Oct. 1979 69 p
(NASA-TP-1519; L-12842) Avail: NTIS HC A04/MF A01 CSCL 01C

The use of decoupled longitudinal controls during the approach and landing of a typical twin-engine jet transport in the presence of wind shear was studied. The simulation included use of a localizer and flight director to capture and maintain a 3 deg glide slope. The pilot then completed the landing by using visual cues provided below an altitude of 200 m by closed-circuit television and a terrain model. The decoupled controls used constant prefilter and feedback gains to provide steady state decoupling of flight path angle, pitch angle, and forward velocity. The use of the decoupled control system improved pilot performance during the approach and at touchdown in the presence of wind shears. The pilots preferred the decoupled controls and rated the task 1 to 3 increments better on a pilot rating scale, depending on wind conditions, than was the case when conventional controls were used. J.M.S.

N79-33219# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
INTEGRITY IN ELECTRONIC FLIGHT CONTROL SYSTEMS
Peter R. Kurzhals and R. Onken (DFVLR, Brunswick, West Germany) Jul. 1979 20 p refs Prepared in cooperation with NASA, Washington, D. C.
(AGARD-AR-136; ISBN-92-835-1329-0) Avail: NTIS HC A02/MF A01

The evolution of the requirements of improved flight control systems, the status of flight control reliability, and highlights of the methods promising integrity of those systems are outlined. M.M.M.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N79-33220*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ENVIRONMENTAL FOG/RAIN VISUAL DISPLAY SYSTEM FOR AIRCRAFT SIMULATORS Patent Application
Wendell D. Chase, inventor (to NASA) Filed 29 Jun. 1979 62 p
(NASA-Case-ARC-11158-1; US-Patent-Appl-SN-053566) Avail: NTIS HC A07/MF A01 CSCL 14B

A combination of electronic and mechanical integrated elements which operate together are used to produce realistic environmental conditions that would actually be encountered by a pilot flying an aircraft. The electronic elements of the system include a real time digital computer, a calligraphic color display which simulates landing lights of selective intensity, and a color television camera for producing a moving color display of the airport runway as depicted on a model terrain board. The mechanical simulation elements of the system include an environmental chamber which can produce natural fog, nonhomogeneous fog, rain and fog combined, or rain only. A pilot looking through the aircraft windscreen will look through the fog and/or rain generated in the environmental chamber on to a viewing screen with the simulated color image of the airport runway, and observe a very real simulation of actual conditions of a runway as it would appear through actual fog and/or rain. NASA

N79-33221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CRYOGENIC WIND TUNNELS: A SELECTED ANNOTATED BIBLIOGRAPHY
Marie H. Tuttle and Robert A. Kilgore Oct. 1979 30 p
(NASA-TM-80168; L-13309) Avail: NTIS HC A03/MF A01 CSCL 14B

The design and characteristics of cryogenic wind tunnels are discussed in the 124 publications included. Evaluations of

cryogenic fluids used as wind tunnel test gases and tests performed in the cryogenic wind tunnels are reported. A.W.H.

N79-33222# National Aviation Facilities Experimental Center, Atlantic City, N. J.
EVALUATION OF THE PULSED ACOUSTIC DOPPLER WITH SHEAR SENSING SYSTEM AT DULLES INTERNATIONAL AIRPORT Final Report, Feb. - Dec. 1977
Peter V. Versage and Augusto M. Ferrara Aug. 1979 31 p (FAA Proj. 154-751-100)
(AD-A073206; FAA-RD-78-158; FAA-NA-79-1) Avail: NTIS HC A03/MF A01 CSCL 01/5

The test and evaluation of the pulsed acoustic Doppler wind shear sensing system (PADWSS) was directed to determine if the system could accurately and continuously sense windspeed and wind direction at 30 meter intervals from 30 to 510 meters above ground level. Three other wind shear sensing systems were used for comparison: (1) instrumented tethered balloon in close proximity, (2) instrumented aircraft flights using flat runs at various altitudes and glide slope approaches, and (3) radar wind shear sensing. It was concluded that the evaluated PADWSS system cannot be utilized on an operational basis. It was adversely affected by environmental conditions (bare trees, snow) and ground windspeeds in excess of 5 meters/second (9.72 knots). M.M.M.

N79-33223# O'Donnell and Associates, Inc., Pittsburgh, Pa.
HYPERVELOCITY WIND TUNNEL COMPONENTS STRUCTURAL EVALUATION, VOLUME 1 Final Report
D. Peterson and E. Westerman May 1979 153 p refs
(Contract N60921-78-C-0013)
(AD-A071029; ODAI-1270-8-79-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 13/7

A structural evaluation of the large threaded pressure vessels in the wind tunnel facility was performed using finite element techniques coupled with fatique and fracture mechanics analyses of the critical locations. The results of this evaluation show that these threaded pressure vessels have limited fatigue life due to high stress concentrations at the root of the thread root radii in the threaded end closures. Design modifications were made to the most critical end closures (bottom end of mach 14/18 heater vessel and inlet end of driver vessel) to increase the design life of these pressure vessels. The design life of all of the threaded pressure vessels was also increased by reducing the maximum pressure at which they are operated. Periodic inspection requirements which account for variable pressure cycling and mean stress effects were also developed for the critical areas of these threaded pressure vessels. The net result of the design modifications, reduced operating pressures and periodic inspection requirements is to increase the design life and confidence in the safety related structural integrity of the threaded pressure vessels in the wind tunnel facility. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N79-33224* National Aeronautics and Space Administration, Washington, D. C.
PIONEER SATURN RESULTS ARE SUMMARIZED
24 Oct. 1979 8 p
(NASA-News-Release-79-135; P79-10136) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The Pioneer 11 Space Probe spent 10 days photographing and measuring the ringed planet, Saturn. Major findings are briefly summarized. J.M.S.

N79-33225*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REPORT ON ACTIVE AND PLANNED SPACECRAFT AND EXPERIMENTS
R. W. Vostreys, ed. and R. Horwitz, ed. Aug. 1979 319 p
(NASA-TM-80505; NSSDC/WDC-A-R/S-79-03) Avail: NTIS HC A14/MF A01 CSCL 22A

Information concerning concerning active and planned spacecraft and experiments known to the National Space Science Data Center are included. The information contains a wide range of disciplines: astronomy, earth sciences, meteorology, planetary sciences, aeronomy, particles and fields, solar physics, life sciences, and material sciences. These spacecraft projects represent the efforts and funding of individual countries as well as cooperative arrangements among different countries. Approximately 850 articles are included. M.M.M.

N79-33226*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUMMARIES OF EARLY MATERIALS PROCESSING IN SPACE EXPERIMENTS
Robert J. Naumann and Darby Mason Aug. 1979 83 p refs
(NASA-TM-78240) Avail: NTIS HC A05/MF A01 CSCL 22A

Objectives, methods, and results of low-gravity materials processing experiments are summarized, and a bibliography of published results for each experiment is provided. Included are drop tower experiments, the Apollo demonstration experiments, the skylab experiments and demonstration experiments, and the Apollo-Soyuz experiments and demonstrations. The findings of these experiments in the fields of crystal growth, metallurgy, and fluid behavior are summarized. Author

N79-33227*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
EXTRATERRESTRIAL PROCESSING AND MANUFACTURING OF LARGE SPACE SYSTEMS, VOLUME 1, CHAPTERS 1-6 Final Report
Rene H. Miller and David B. S. Smith Sep. 1979 307 p refs 3 Vol.
(Contract NAS8-32925)
(NASA-CR-161293-Vol-1; SSL-15-79) Avail: NTIS HC A14/MF A01 CSCL 22A

Space program scenarios for production of large space structures from lunar materials are defined. The concept of the space manufacturing facility (SMF) is presented. The manufacturing processes and equipment for the SMF are defined and the conceptual layouts are described for the production of solar cells and arrays, structures and joints, conduits, waveguides, RF equipment radiators, wire cables, and converters. A 'reference' SMF was designed and its operation requirements are described. R.E.S.

N79-33228*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
EXTRATERRESTRIAL PROCESSING AND MANUFACTURING OF LARGE SPACE SYSTEMS, VOLUME 2, CHAPTERS 7-14 AND APPENDICES Final Report
Rene H. Miller and David B. S. Smith Sep. 1979 482 p refs 3 Vol.
(Contract NAS8-32925)
(NASA-CR-161293-Vol-2; SSL-16-79) Avail: NTIS HC A21/MF A01 CSCL 22A

Production and support equipment specifications are described for the space manufacturing facility (SMF). Defined production equipment includes electromagnetic pumps for liquid metal, metal alloying furnaces, die casters, electron beam welders and cutters, glass forming for structural elements, and rolling. A cost analysis is presented which includes the development, the aquisition of all SMF elements, initial operating cost, maintenance and logistics cost, cost of terrestrial materials, and transportation cost for each major element. Computer program listings and outputs are appended. R.E.S.

N79-33229*# Massachusetts Inst. of Tech., Cambridge. Space Systems Lab.
EXTRATERRESTRIAL PROCESSING AND MANUFACTURING OF LARGE SPACE SYSTEMS. VOLUME 3: EXECUTIVE SUMMARY Final Report
Rene H. Miller and David B. S. Smith Sep. 1979 51 p 3 Vol.
(Contract NAS8-32925)
(NASA-CR-161293-Vol-3; SSL-17-79) Avail: NTIS HC A04/MF A01 CSCL 22A

Facilities and equipment are defined for refining processes to commercial grade of lunar material that is delivered to a

'space manufacturing facility' in beneficiated, primary processed quality. The manufacturing facilities and the equipment for producing elements of large space systems from these materials and providing programmatic assessments of the concepts are also defined. In-space production processes of solar cells (by vapor deposition) and arrays, structures and joints, conduits, waveguides, RF equipment radiators, wire cables, converters, and others are described. R.E.S.

N79-33230*# IIT Research Inst., Chicago, Ill.
MANUFACTURING PROCESS APPLICATIONS TEAM (MATEAM) Quarterly Status Report, 1 May - 31 Jul. 1979
30 Aug. 1979 32 p refs
(Contract NAS8-32229)
(NASA-CR-161310; QSR-2) HC A03/MF A01 CSCL 22A

The transfer of NASA technology to the industrial sector is reported. Presentations to the machine tool and robot industries and direct technology transfers of the Adams Manipulator arm, a-c motor control, and the bolt tension monitor are discussed. A listing of proposed RTOP programs with strong potential is included. A detailed description of the rotor technology available to industry is given. J.M.S.

N79-33231*# National Aeronautics and Space Administration, Washington, D. C.
SALYUT-6-SOYUZ: OUR COMMENTARY
A. Burnazyan Oct. 1979 7 p Transl. into ENGLISH from Pravda (Moscow), 5 Sep. 1979 p 5 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75930) Avail: NTIS HC A02/MF A01 CSCL 22A

The physical exercise and medical monitoring programs conducted during the Salyut-6-Soyuz space flight are discussed. A special suit for physical exercise which provides a load in the longitudinal direction of the body is described. A vacuum device to create reduced pressure and thus prevent disruption of blood circulation is reported. Medical examination of the cosmonauts upon landing and their reported health is discussed. A.W.H.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N79-33232* National Aeronautics and Space Administration, Washington, D. C.
SATELLITE TO STUDY EARTH'S MAGNETIC FIELD
19 Oct. 1979 34 p
(NASA-News-Release-79-129; P79-10131) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 22A

The Magnetic Field Satellite (Magsat) designed to measure the near earth magnetic field and crustal anomalies is briefly described. A scalar magnetometer to measure the magnitude of the earth's crustal magnetic field and a vector magnetometer to measure magnetic field direction as well as magnitude are included. The mission and its objectives are summarized along with the data collection and processing system. J.M.S.

N79-33233*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SYSTEM NOISE ANALYSIS OF THE DUMBBELL TETHERED SATELLITE FOR GRAVITY-GRADIENT MEASUREMENTS Final Technical Report, 1 Jul. 1978 - 30 Jun. 1979
Giuseppe Colombo Oct. 1979 108 p refs
(Grant NsG-8063)
(NASA-CR-162333) Avail: NTIS HC A06/MF A01 CSCL 22B

An analysis of the dumbbell gravity gradiometer concept for measuring short wavelength variations in the earth's gravity gradient is presented. Variations in the gradient are recorded by measuring tension variations in a vertically stabilized satellite consisting of heavy masses connected by a long wire or rod. Tension noise arises from the excitation of various mechanical oscillations of the system. The principal noise sources that were identified are fluctuations in atmospheric drag heating and drag force resulting from density variations and winds. Approximate analytical expressions are presented for the tension noise as a function of the system design parameters for various possible configurations. Computer simulations using numerical integration were performed to study the tension noise for several sample cases. Three designs consistent with Shuttle launch capabilities are discussed. A.W.H.

N79-33234# National Environmental Satellite Center, Suitland, Md.
THE TIROS-N/NOAA OPERATIONAL SATELLITE SYSTEM
W. John Hussey May 1979 42 p
(PB-297009/3; NOAA-S/T-79-199; NOAA-79050703) Avail: NTIS HC A03/MF A01 CSCL 22B

The third generation polar system, TIROS-N, carried into space new environmental instruments which are major technological advances over ITOS. Specifically, these new capabilities include: (1) higher resolution, cloud cover observations on a local and global scale; (2) improved observations of vertical temperature and water vapor profiles on a global scale; and (3) first operations flight of a high capacity data collection and platform locations system. TIROS-N is the current NOAA operational polar orbiting satellite. The second of this dual satellite system, NOAA-A, will be designated NOAA-6 once in orbit. The TIROS-N/NOAA-A spacecraft, instrument payload, and the ground data processing and handling system operated by NOAA are discussed. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N79-33235*# Aerojet Liquid Rocket Co., Sacramento, Calif.
ORBIT TRANSFER VEHICLE (OTV) ENGINE, PHASE A STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
J. A. Mellish 29 Jun. 1979 100 p
(Contract NAS8-32999)
(NASA-CR-161297; Rept-32999-F-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 22B

Design and parametric data for the hydrogen oxygen engine used in the orbiter transfer vehicle is presented. The engine design is analyzed and minimum engine performance and man

rating requirements are discussed. Candidate cycle performance, weight and tradeoff analysis, and cost estimates are reported. A.W.H.

N79-33236*# Aerojet Liquid Rocket Co., Sacramento, Calif.
ORBIT TRANSFER VEHICLE (OTV) ENGINE, PHASE A STUDY. VOLUME 2: STUDY Final Report
J. A. Mellish 29 Jun. 1979 261 p refs
(Contract NAS8-32999)
(NASA-CR-161298; Rept-32999-F-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 22B

The hydrogen oxygen engine used in the orbiter transfer vehicle is described. The engine design is analyzed and minimum engine performance and man rating requirements are discussed. Reliability and safety analysis test results are presented and payload, risk and cost, and engine installation parameters are defined. Engine tests were performed including performance analysis, structural analysis, thermal analysis, turbomachinery analysis, controls analysis, and cycle analysis. A.W.H.

N79-33237*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 1: EXECUTIVE SUMMARY
Aug. 1979 28 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160321; MDC-G7870-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 22B

An array deployment assembly, power regulation and control assembly, the necessary interface, and display and control equipment comprise the power extension package (PEP) which is designed to provide increased power and duration, as well as reduce fuel cell cryogen consumption during Spacelab missions. Compatible with all currently defined missions and payloads, PEP imposes minimal weight and volume penalties on sortie missions, and can be installed and removed as needed at the launch site within the normal Orbiter turnaround cycle. The technology on which it is based consists of a modified solar electric propulsion array, standard design regulator and control equipment, and a minimally modified Orbiter design. The requirements from which PEP was derived, and the system and its performance capabilities are described. Features of the recommended project are presented. A.R.H.

N79-33238*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 2: PEP
Aug. 1979 135 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160322; MDC-G7870-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 22B

User power, duration, and orbit requirements, which were the prime factors influencing power extension package (PEP) design, are discussed. A representative configuration of the PEP concept is presented and the major elements of the system are described as well as the PEP-to-Orbiter and remote manipulator interface provisions. A.R.H.

N79-33239*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 3: PEP ANALYSIS AND TRADEOFFS
Aug. 1979 246 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160323; MDC-G7870-Vol-3) Avail: NTIS HC A11/MF A01 CSCL 22B

The objectives, conclusions, and approaches for accomplishing 19 specific design and analysis activities related to the installation of the power extension package (PEP) into the Orbiter cargo bay are described as well as those related to its deployment, extension, and retraction. The proposed cable handling system designed to transmit power from PEP to the Orbiter by way of the shuttle remote manipulator system is described and a preliminary specification for the gimbal assembly, solar array drive is included. A.R.H.

N79-33240*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 4: PEP FUNCTIONAL SPECIFICATION
Aug. 1979 76 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160324; MDC-G7870-Vol-4) Avail: NTIS HC A05/MF A01 CSCL 22B

The functional, performance, design, and test requirements for the Orbiter power extension package and its associated ground support equipment are defined. Both government and nongovernment standards and specifications are cited for the following subsystems: electrical power, structural/mechanical, avionics, and thermal control. Quality control assurance provisions and preparation for delivery are also discussed. A.R.H.

N79-33241*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 5: PEP ENVIRONMENTAL SPECIFICATION
Aug. 1979 45 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160325; MDC-G7870-Vol-5) Avail: NTIS HC A03/MF A01 CSCL 22B

This specification establishes the natural and induced environments to which the power extension package may be exposed during ground operations and space operations with the shuttle system. Space induced environments are applicable at the Orbiter attach point interface location. All probable environments are systematically listed according to each ground and mission phase. A.R.H.

N79-33242*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 6: PEP PRODUCT ASSURANCE
Aug. 1979 27 p refs 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160326; MDC-G7870-Vol-6) Avail: NTIS HC A03/MF A01 CSCL 22B

Safety, reliability and quality assurance design analysis results are presented as well as design requirements recommended for implementation in the PEP design. A.R.H.

N79-33243*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 7: PEP LOGISTICS AND TRAINING PLAN REQUIREMENTS
Aug. 1979 20 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160327; MDC-G7870-Vol-7) Avail: NTIS HC A02/MF A01 CSCL 22B

Recommendations for logistics activities and logistics planning are presented based on the assumption that a system prime contractor will perform logistics functions to support all program hardware and will implement a logistics system to include the planning and provision of products and services to assure cost effective coverage of the following: maintainability; maintenance; spares and supply support; fuels; pressurants and fluids; operations and maintenance documentation training; preservation, packaging and packing; transportation and handling; storage; and logistics management information reporting. The training courses, manpower, materials, and training aids required will be identified and implemented in a training program. A.R.H.

N79-33244*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 9: PEP DESIGN, DEVELOPMENT AND TEST PLANS
Aug. 1979 45 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160328; MDC-G7870-Vol-9) Avail: NTIS HC A03/MF A01 CSCL 22B

A plan for the production of two PEP flight systems is defined. The task's milestones are described. Provisions for the development and assembly of new ground support equipment required for both testing and launch operations are included. A.R.H.

N79-33245*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 10: PEP PROJECT PLAN
Aug. 1979 70 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160329; MDC-G7870-Vol-10) Avail: NTIS HC A04/MF A01 CSCL 22B

Contents: project plan summary; project and mission objectives; related studies and technology support activities; technical summary; management; procurement approach; project definition items and schedule; resources; management review; controlled items; and safety, reliability, and quality assurance. A.R.H.

N79-33246*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 11: PEP, COST, SCHEDULES, AND WORK BREAKDOWN STRUCTURE DICTIONARY
Aug. 1979 38 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160330; MDC-G7870-Vol-11) Avail: NTIS HC A03/MF A01 CSCL 22B

Cost scheduling and funding data are presented for the reference design of the power extension package. Major schedule milestones are correlated with current Spacelab flight dates. Funding distributions provide for minimum expenditure during the first year of the project. A.R.H.

N79-33247*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
POWER EXTENSION PACKAGE (PEP) SYSTEM DEFINITION EXTENSION, ORBITAL SERVICE MODULE SYSTEMS ANALYSIS STUDY. VOLUME 12: PEP DATA ITEM DESCRIPTIONS
Aug. 1979 115 p 12 Vol.
(Contract NAS9-15532)
(NASA-CR-160331; MDC-G7870-Vol-12) Avail: NTIS HC A06/MF A01 CSCL 22B

Contractor information requirements necessary to support the power extension package project of the space shuttle program are specified for the following categories of data: project management; configuration management; systems engineering and test; manufacturing; reliability, quality assurance and safety; logistics; training; and operations. A.R.H.

N79-33248# IBM Federal Systems Div., Houston, Texas.
DEPARTMENT OF DEFENSE SPACE TRANSPORTATION SYSTEM ORBITER AVIONICS SOFTWARE INTEGRATION STUDY. ANALYSIS OF ORBITER SYSTEMS TO MEET MASE REQUIREMENTS Special Study Report, Feb. - Apr. 1979
L. S. Diamant, E. W. Smythe, and R. H. Wolfe, Jr. 17 Apr. 1979 61 p refs
(Contract F04701-76-C-0271)
(AD-A070634; RES-78-11-1; SAMSO-TR-79-37) Avail: NTIS HC A04/MF A01 CSCL 09/2

This study analyzes the use of the Space Shuttle Orbiter data processing subsystems in satisfying requirements for the integral astronaut participation in selected DOD space shuttle experiments. Key aspect of the study was the analysis, based on system implementation, to determine degrees of data protection from unauthorized use. Typical image processing and enhancing techniques versus display response time for astronaut interactions were assessed. The study concluded that a degree of data protection is achieved with the present orbiter avionics system by isolating one of the five general purpose computers with an out-of-sync procedure. Additional levels of data protection could be achieved only with additional hardware. GRA

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N79-33249# General Accounting Office, Washington, D. C. Logistics and Communications Div.
SHOULD NAVSTAR BE USED FOR CIVIL NAVIGATION. FAA SHOULD IMPROVE ITS EFFORTS TO DECIDE
30 Apr. 1979 51 p
(PB-295301/6; LCD-79-104) Avail: NTIS HC A04/MF A01 CSCL 22A

The adequacy and timeliness of FAA's evaluation program of DOD's planned NAVSTAR satellite navigation system to determine if it should also become the primary civil air navigation system was reviewed. It is recommended that FAA improve its NAVSTAR evaluation program if NAVSTAR's benefits to civil aviation are to be fully considered. GRA

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N79-34119*# National Aeronautics and Space Administration, Washington, D. C.
INTRODUCTION TO SKYLAB
In its Skylab's Astron. and Space Sci. 1979 p 1-6 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 22B

N79-34125*# National Aeronautics and Space Administration, Washington, D. C.
ORBITAL ENVIRONMENT
In its Skylab's Astron. and Space Sci. 1979 p 93-115 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N79-33250*# Rocketdyne, Canoga Park, Calif.
ORBITAL TRANSFER VEHICLE ADVANCED EXPANDER CYCLE ENGINE POINT DESIGN STUDY Bimonthly Report
A. Martinez 12 Oct. 1979 14 p
(Contract NAS8-33568)
(NASA-CR-161318; ASR79-109; BMPR-1) Avail: NTIS HC A02/MF A01 CSCL 21H

A detailed computer model of the expander cycle engine system steady-state operation was developed. Payload performance data for the expander cycle engine for 100K pounds and 65K pounds Space Shuttle missions were examined to establish peak payload thrusts. It was found that peak payload for the 100K pound gross weight single engine case occurred at nearly 15,000 pounds thrust for both engine mixture ratios of 6:1 and 7:1. Peak payload at engine mixture ratio of 6:1 was 4 percent greater than at 7:1 mixture ratio. The two engine configuration peak paYloads occurred at engine thrust below 7,500 pounds (extrapolated) and were lower than single engine payloads. For the 65K pound gross weight mission, peak payloads for the single engine configuration occurred at nearly 10,000 pounds for both mixture ratios. Mixture ratio of 7:1 payloads were 5 percent lower than 6:1 payloads. Two engine configuration payloads occurred at engine thrusts considerably below 10K pounds. R.E.S.

N79-33251*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
CHARGE-EXCHANGE PLASMA ENVIRONMENT FOR AN ION DRIVE SPACECRAFT
Harold R. Kaufman (Colorado State Univ.) and M. Ralph Carruth, Jr. 1 Oct. 1979 37 p refs
(Contract NAS7-100)
(NASA-CR-162358; JPL-Pub-79-90) Avail: NTIS HC A03/MF A01 CSCL 21C

The charge exchange plasma environment around a spacecraft that uses mercury ion thrusters for propulsion is described. The interactions between the plasma environment and the spacecraft are determined and a model which describes the propagation of the mercury charge exchange plasma is discussed. The model is extended to describe the flow of the molybdenum component of the charge exchange plasma. The uncertainties in the models for various conditions are discussed and current drain to the solar array, charge exchange plasma material deposition, and the effects of space plasma on the charge exchange plasma propagation are addressed. A.W.H.

N79-33252*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SERT 2 1979 EXTENDED FLIGHT THRUSTER SYSTEM PERFORMANCE
W. R. Kerslake and L. R. Ignaczak 1979 22 p refs Presented at 14th Intern. Conf. on Electric Propulsion, Princeton, N. J., 31 Oct. - 2 Nov. 1979; sponsored by AIAA and Deutsche Gesselschaft fuer Luft- und Raumfahrt
(NASA-TM-79256; E-168; AIAA-Paper-79-2063) Avail: NTIS HC A02/MF A01 CSCL 21H

Steady state tests of the thruster 2 system on the SERT 2 spacecraft are presented. A direct thrust measurement was obtained for the ion thruster during operations to increase the spacecraft spin rate to maintain spacecraft attitude stability. The continued restart tests of thruster 1 and a report on the general status of all spacecraft systems including the main solar array are presented. A.W.H.

N79-33253*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
REDUCED POWER PROCESSOR REQUIREMENTS FOR THE 30-cm DIAMETER Hg ION THRUSTER
Vincent K. Rawlin 1979 14 p refs Presented at the 14th Intern. Conf. on Electric Propulsion, Princeton, N. J., 30 Oct. - 1 Nov. 1979; sponsored by AIAA and Deutsche Gesselschaft fuer Luft- und Raumfahrt
(NASA-TM-79257; E-169; AIAA-Paper-79-2081) Avail: NTIS HC A02/MF A01 CSCL 21C

An evaluation of simplifications for the thruster power processor interface for a 30 cm Hg ion thruster is presented. Tests on the engine, thruster control, and the power supplies are performed. Reduced power processors requirements are defined and the impact on thruster design, performance, and lifetime are assessed. A.W.H.

N79-33254*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY RESULTS OF THE MISSION PROFILE LIFE TEST OF A 30 cm Hg BOMBARDMENT THRUSTER
R. T. Bechtel and E. L. James (Xerox-EOS, Pasadena, Calif.) 1979 23 p refs Presented at 14th Intern. Conf. on Electric Propulsion, Princeton, N. J., 31 Oct. - 2 Nov. 1979; sponsored by AIAA and Deutsche Gesselschaft fuer Luft- und Raumfahrt
(NASA-TM-79261; E-175) Avail: NTIS HC A02/MF A01 CSCL 20C

Long term tests were performed on a 30 cm Hg bombardment thruster and a power processing unit to determine lifetime characteristics. The thruster performance data and other operational characteristics taken at various times during the test segment are presented and evaluated with the life limiting mechanisms: discharge chamber erosion, deposition and spalling, external erosion, cathode degradation, and propellant isolator leakage. The control algorithms for thruster start up, steady state operation, throttle, detection and correction of off normal conditions, and shutdown are discussed. A.W.H.

N79-33255*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NEUTRALIZATION TESTS ON THE SERT 2 SPACECRAFT
William R. Kerslake and Stanley Domitz 1979 24 p refs Presented at 14th Intern. Conf. on Electric Propulsion, Princeton, N. J., 31 Oct. - 2 Nov. 1979; sponsored by AIAA and Deutsche Gesselschaft fuer Luft- und Raumfahrt
(NASA-TM-79271; E-191; AIAA-Paper-79-2064) Avail: NTIS HC A02/MF A01 CSCL 22B

Neutralization test data obtained on the SERT 2 spacecraft are presented. Tests included ion beam neutralization of a thruster by a close (normal design) neutralizer as well as by a distant (1 meter) neutralizer. Parameters affecting neutralization, such as neutralizer bias voltage, neutralizer anode voltage, local spacecraft plasma density, and solar array voltage configuration were varied and changes in plasma potentials were measured. A plasma model is presented as an approximation of observed results. A.W.H.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N79-33256# California Univ., Los Angeles. Dept. of Chemistry.
THE ALPHA-SUBSTITUTION EFFECT, INTRAMOLECULAR OR MEDIUM INDUCED
J. Prochorow, W. Hopewell, and M. A. El-Sayed Jul. 1979 12 p refs
(Contract N00014-75-C-0602)
(AD-A071808; TR-34) Avail: NTIS HC A02/MF A01 CSCL 07/3

The lifetimes of ethyl- and tert-butyl benzene are measured in the gas phase and compared with one another and with those in solution. There is a large increase in the nonradiative lifetime upon going to the gas phase. Furthermore, the observed lifetime is found to be 80 nsec at low pressures, independent of the substituent, contrary to the results in solution (the alpha-substitution effect). These results suggest that the alpha-substitution effect is solvent induced. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N79-33257 Pennsylvania State Univ., University Park.
STRUCTURAL AND OXIDATION EFFECTS ON SUBCRITICAL CRACK GROWTH IN GRAPHITE Ph.D. Thesis
Jerry Lester Wood 1979 253 p
Avail: Univ. Microfilms Order No. 7922363

Four fine-grained polycrystalline graphites were characterized with respect to their structure and fracture related properties. Subcritical crack growth was measured in air at room temperature using the double-torsion method. The fracture toughness, K sub Ic, of the as-received materials was measured by both the double-torsion method and the controlled microflaw technique. The toughness of the oxidized graphites was measured by the double-torsion method. It was concluded that the oxidation conditions can markedly affect the magnitude of decreases observed for the physical, elastic and mechanical properties of these graphites. Using scanning electron microscope fractography, subcritical crack growth observations were correlated with processing, microstructure and oxidation effects. Results are compared with other carbon and graphite materials.
Dissert. Abstr.

N79-33258*# United Technologies Research Center, East Hartford, Conn.
DEVELOPMENT OF SiAlON MATERIALS Final Report, Jun. 1975 - Sep. 1979
G. K. Layden Sep. 1979 145 p refs
(Contract NAS3-19712)
(NASA-CR-159675; R79-912997-39) Avail: NTIS HC A07/MF A01 CSCL 11D

Cold pressing and sintering techniques were used to produce ceramic test specimens in which the major phase was either Si3N4 or a solid solution having the beta Si3N4 structure. Additional components were incorporated to promote liquid phase sintering. Glass and/or crystalline phase were consequently retained in boundaries between Si3N4 grains which largely determined the physical properties of the bodies. Systems investigated most extensively included R-Si-Al-O-N (R = rare earth element) Zr-Si-Al-O-N, Y-Si-Be-O-N, and R1-R2-Si-O-N. Room temperature and 1370 C modulus of ruptured, 1370 C creep, and oxidation behavior are discussed in terms of phase relationships in a parent quinery, and relavent oxide systems.
Author

N79-33259*# General Dynamics/Convair, San Diego, Calif.
FEASIBILITY STUDY ON THE DEVELOPMENT OF TOUGH, MOISTURE-RESISTANT LAMINATING RESINS Final Report
R. A. Brand and E. S. Harrison Washington NASA Oct. 1979 24 p refs
(Contract NAS1-15111)
(NASA-CR-3185; CASD-NAS-012) Avail: NTIS HC A02/MF A01 CSCL 11D

The potential of cyanate resins as replacement for epoxy resins in composites with graphite fiber reinforcement was investigated in an effort to provide improved moisture resistance and toughness in laminating systems at a projected cost, handleability, and processing requirements equivalent to 400 K (260 F) curing epoxies. Monomer synthesis, formulation, blending, resin preparation, catalysis studies, prepreg preparation, laminate fabrication, and testing are discussed. A graphite fiber reinforced laminate was developed with 95 percent retention of the original 363 K (180 F) flexural strength and 70 percent retention of the 363 K (180 F) short beam shear strength after 500 hour exposure to 95 + 7 relative humidity at 324 K (120 F).
A.R.H.

N79-33260*# Avco Corp., Lowell, Mass. Specialty Materials Div.
A STUDY OF THE DEPOSITION OF CARBIDE COATINGS ON GRAPHITE FIBERS
R. J. Suplinskas and T. W. Henze Sep. 1979 50 p refs
(Contract NAS1-15374)
(NASA-CR-159133) Avail: NTIS HC A03/MF A01 CSCL 11D

The chemical vapor deposition of boron carbide and silicon carbide on graphite fibers to increase their electrical resistance was studied. Silicon carbide coatings were applied without degradation of the mechanical properties of the filaments. These coatings typically added 1000 ohms to the resistance of a filament as measured between two mercury pools. When SiC-coated filaments were oxidized by refluxing in boiling phosphoric acid, average resistance increased by an additional 1000 ohms; in addition resistance increases as high as 150 K ohms and breakdown voltages as high as 17 volts were noted. Data on boron carbide coatings indicated that such coatings would not be effective in increasing resistance, and would degrade the mechanical properties.
Author

N79-33261# Kansas State Univ., Manhattan. Dept. of Electrical Engineering.
ELECTROMAGNETIC INTERACTIONS WITH ADVANCED COMPOSITE MATERIALS Final Report, 1 Feb. 1976 - 31 May 1978
K. F. Casey 30 Apr. 1979 17 p refs
(Grant AF-AFOSR-2980-76; AF Proj. 2301)
(AD-A071924; AFOSR-79-0893TR) Avail: NTIS HC A02/MF A01 CSCL 11/4

Research objectives and accomplishments under AFOSR Grant 76-2980 are described. These include studies of plane electromagnetic wave interactions with planar sheets, circular cylindrical shells, and spherical shells of advanced composite materials; and a study of the effects of transient current injection into a planar sheet of advanced composite material. The effects of anisotropy of composite laminates on their electromagnetic characterization and interactions are also discussed. The frequency range over which the electromagnetic characterizations and interaction analyses are valid is that characteristic of the nuclear electromagnetic pulse.
GRA

N79-33262# Washington State Univ., Pullman. Dept. of Materials Science and Engineering.
ELECTROCHEMICAL POLYMERIZATION AND DEPOSITION ON CARBON FIBERS Final Technical Report, Mar. 1975 - Apr. 1979
R. V. Subramanian Jul. 1979 16 p
(Contract N00014-75-C-0792)
(AD-A072012) Avail: NTIS HC A02/MF A01 CSCL 11/4

The electrodic polymerization on carbon fibers of a variety of monomers having different functional groups has been investigated. The objective was to demonstrate the effect of such polymer coating on the properties of polymer composites prepared from the coated fibers. The electropolymerization of novel monomers encountered in this study was pursued in some detail. In addition to usual vinyl polymerizations, some novel cyclic monomers were identified as capable of producing the desired polymer layer on fiber under appropriate polymerization conditions. In many instances, grafting of the surface polymer to the fiber was observed.
GRA

N79-33263# Southwest Research Inst., San Antonio, Tex.
NONDESTRUCTIVE EVALUATION OF FIBER REINFORCED EPOXY COMPOSITES: A STATE-OF-THE-ART SURVEY Final Report, 28 Sep. 1978 - 30 Apr. 1979
George A. Matzkanin, Gary L. Burkhardt, and Cecil M. Teller Apr. 1979 195 p refs
(Contract DLA900-77-C-3733)
(AD-A071973; SwRI-15-4823-510;
USAAVRADCOM-TR-79-24) Avail: NTIS HC A09/MF A01 CSCL 11/4

This report contains the essential findings of a comprehensive survey of the state-of-the-art in nondestructive evaluation (NDE) of fiber reinforced epoxy composites with emphasis on the types presently used or planned for use in Army helicopter components. Primary consideration is given to the NDE of glass fiber composites because of its extensive use in the fabrication of advanced helicopter rotor blades with secondary consideration given to the NDE of Kevlar, graphite, and boron reinforced epoxy. A computer search of the literature was performed to compile an extensive bibliography of source documents. Pertinent documents were reviewed and NDE results categorized according to NDE methodology and type of composite. For each composite

type, tables were developed listing defects and property variations detected by various NDE methods. These tables along with literature references are included in the report. The status of NDE of fiber reinforced epoxy composites with respect to available techniques, ongoing research, and projected future needs is reviewed and summarized. GRA

N79-33264# Physics International Co., San Leandro, Calif.
SURFACE CONDITIONING OF CARBON PHENOLIC SPECIMENS BY PULSED ELECTRON BEAMS Final Report, 22 May - 1 Jun. 1978
K. Triebes Sep. 1978 54 p
(Contract DNA001-77-C-0193)
(AD-A071370; AD-E300527; PIFR-1050-2; DNA-4703F) Avail: NTIS HC A04/MF A01 CSCL 11/4

The OWL 2 generator, in conjunction with the large area beam hardware, generated a reproducible uniform electron beam capable of removing between 0.013 and 0.025 cm depth of phenolic from carbon phenolic ablator surfaces. The beam had a diameter of 19 cm (280 sq cm). Specimens of staple rayon and continuous filament rayon carbon phenolic were irradiated. Samples included both flat and conical section configurations. Stress pulse measurements were performed on each type of material using quartz gages. The irradiated specimens were forwarded to Science Applications, Inc., and Prototype Development Associates for further testing. GRA

N79-33265# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
EVALUATION OF SELECTED SPINELS AND PEROVSKITES AS CANDIDATE HIGH-TEMPERATURE MOLYBDENUM COATINGS
Max L. Glenn, Jack L. Henry, and Arnold Adams 1979 38 p refs
(PB-295873/4; BM-RI-8351) Avail: NTIS HC A03/MF A01 CSCL 11D

Research to develop molybdenum as a potential substitute for superalloys containing the strategic and critical materials, nickel, chromium, and cobalt is presented. Since molybdenum requires protection from oxidation at high temperatures, several complex oxides of the spinel and perovskite structure were investigated to determine which possessed the greatest potential for use as oxidation-barrier coatings. Various high-temperature properties that are important for oxidation-resistant coatings were examined. From the evaluation of high temperature properties, two spinels ($MgCr_2O_4$ and $MgAl_2O_4$) stand above the other oxides as possible coatings for molybdenum. GRA

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N79-33266 California Inst. of Tech., Pasadena.
A THEORETICAL AND EXPERIMENTAL INVESTIGATION OF SURFACE STRUCTURES AND GAS-SURFACE INTERACTIONS Ph.D. Thesis
Chi-Ming Chan 1979 424 p
Avail: Univ. Microfilms Order No. 7920343

The gas-surface interactions were studied as well as the geometrical structures of surface and overlayers. Low-energy electron diffraction is employed to determine the structure of both clean metal surfaces and overlayers. An analysis of thermal desorption mass spectrometry is presented. Analytic expressions were derived which allow a determination of the activation energy of desorption and the pre-exponential factor of the desorption rate coefficient using parameters obtained easily from thermal desorption mass spectra. In particular, the spectral peak widths and the temperature at which the maximum rate of desorption occurs may be used to describe both first- and second-order desorption kinetics. Explicit applications of this method in the analysis of several important classes of desorption reactions are presented. Dissert. Abstr.

N79-33267 Duke Univ., Durham, N. C.
GAS CHROMATOGRAPHIC: CATALYTIC PROCEDURES FOR THE DETERMINATION OF INORGANIC IONS Ph.D. Thesis
Mauri Adam Ditzler 1979 147 p
Avail: Univ. Microfilms Order No. 7922745

A novel method for the determination of trace levels of inorganic ions was developed. The method is based on the use of reactions catalyzed by the ions of interest to produce products amenable to gas chromatography. The production of an easily chromatographed species whose concentration is proportional to the non-volatile ionic species allows exploitation of the simplicity and high sensitivity which characterize gas chromatography. Furthermore, because of the catalytic aspects of this procedure, the benefits of chemical amplification are realized. That is, each ion leads to the production of numerous molecules of product, thereby proving high sensitivity. Procedures applicable to both a cation ($Fe(+)$) and an anion ($CN(-)$) were developed. In addition, a procedure for trace metal speciation was developed.
Dissert. Abstr.

N79-33268 Pennsylvania State Univ., University Park.
ANALYTICAL ASPECTS AND DEVELOPMENT OF A GAS CHROMATOGRAPHY-MASS SPECTROMETER-DATA SYSTEM Ph.D. Thesis
Joseph Edward Campana 1979 257 p
Avail: Univ. Microfilms Order No. 7922270

The use of positive and negative ion chemical ionization mass spectrometry analytical methodologies for trace and ultra-trace analysis of environmentally and biologically important substances were investigated and evaluated. Related techniques such as mass spectrometer sample introduction were also investigated. The development of a mini-computer-based gas chromatography-mass spectrometer-data acquisition system is presented. Finally, a unique method for computer simulation of ion trajectories in an electric quadrupole field is discussed, with implications toward improving the sensitivity of current quadrupole mass spectrometers. Dissert. Abstr.

N79-33269 North Dakota State Univ., Fargo.
ANODIC STRIPPING VOLTAMMETRY: ELECTRODE DEVELOPMENT AND COMPUTER AUTOMATION Ph.D. Thesis
Jeffrey Earl Anderson 1979 239 p
Avail: Univ. Microfilms Order No. 7922216

Two new electrodes, The 'graphoxy' and the 'Kelgraf', which were developed for use in anodic stripping voltammetry (ASV) are described. The Both electrodes are easily polished and have proven to be useful alternatives to carbon electrodes presently in use for ASV. The 'Kelgraf' electrode has the additional advantage of being fabricated from a highly inert binder (Kel-F) and is easy to machine into any desired configuration. A computer based instrument (CASV-I) for use in anodic stripping voltammetry is described. The program CASV provides a flexible means of generating a variety of potential waveforms for use in voltammetry. The software also includes digital acquisition of the stripping voltammogram, three means of noise reduction, and the capability of evaluating background corrected oxidation peak parameters.
Dissert. Abstr.

N79-33270 Northeastern Univ., Boston, Mass.
INVESTIGATIONS IN MICROWAVE PLASMA EMISSION SPECTROSCOPY Ph.D. Thesis
Peter Barrett 1979 210 p
Avail: Univ. Microfilms Order No. 7923528

The construction of a microwave plasma emission spectrometer is described difficulties with sample introduction were investigated using the spectrometer. A disadvantage of the microwave induced plasma was its limited tolerance for sample material. Chemical generation methods which convert the analytical species into a gaseous form for removal from the sample matrix were attractive as an introduction means. Hydride evolution techniques for arsenic and antimony were studied using sodium borohydride and zinc as reductants. The hydrogen formed as a reduction by product caused severe plasma instability

and was circumvented by separating the hydrogen from the hydrides by use of Pora Pak-Q column. Nanogram detection limits were obtained for both arsenic and antimony with precision typically better than 5% for arsenic and 12% for antimony.
Dissert. Abstr.

N79-33271 Louisiana State Univ. and A&M Coll., Baton Rouge.
STUDIES OF PURIFICATION PROCESSES BY ATOMIC ABSORPTION AND STUDIES OF THE SPUTTERING PHENOMENON Ph.D. Thesis
Robert I. Garcia 1979 242 p
Avail: Univ. Microfilms Order No. 7921953

A carbon bed atomizer in conjunction with atomic absorption spectroscopy was used to determine directly the concentration of mercury, lead, and cadmium in the ambient atmosphere. A laboratory technique, which consists of resistively heating the rods in a flowing inert gas stream, was developed to reduce the concentration of the elements arsenic, cadmium, iron, lead, mercury, selenium and thallium in spectroscopically pure carbon rods to acceptable levels for air analysis. Laboratory techniques were developed to reduce the lead contamination of filter paper. Various leaching and extraction reagents were used and nitric acid was found to remove the greatest amount of lead from filter paper. The sputtering of copper, platinum and aresenic was investigated as atomization source. A secondary discharge was used to fragment aggregates of metal to free atoms.
Dissert. Abstr.

N79-33272 Arkansas Univ., Fayetteville.
CONFORMATION ANALYSES BY COMBINED AB INITIO AND GAS ELECTRON DIFFRACTION STUDIES Ph.D. Thesis
Ning-Shih Chiu 1979 284 p
Avail: Univ. Microfilms Order No. 7919268

The result of attempts to develop new operational standards for conformational analyses of unperturbed gaseous systems by combining theoretical and experimental procedures in joint investigations are presented. The theoretical procedures involved standard single determinant MO-theory and vibrational analyses. The experimental procedures involved results from vibrational spectroscopy and gas electron diffraction. Ab initio procedures were used to estimate total energies of molecular conformations to generate optimized geometries. Vibrational analyses were executed to calculate mean amplitudes of vibration. Computed molecular properties were then used to constrain least squares refinements of GED data or to interpret GED results. Three molecules were investigated to test these procedures. These were 1,2-dimethyl hydrazine, beryllocene and 3-chlorobenzaldehyde.
Dissert. Abstr.

N79-33273 Wisconsin Univ. - Madison.
DETERMINATION OF THE LANTHANIDES AT TRACE CONCENTRATION LEVELS BY SELECTIVE EXCITATION OF PROBE ION LUMINESCENCE Ph.D. Thesis
Frederick John Gustafson 1978 398 p
Avail: Univ. Microfilms Order No. 7915100

When the trivalent lanthanides are doped into ordered crystalline lattices, configuration mixing can cause intense, narrow linewidth 4f electron transitions (forced electric dipole transitions). Solid state luminescence analytical methods take advantage of the narrow 4f electron energy levels to determine the lanthanides. An intense, narrow bandwidth, tunable dye laser is employed to excite fluorescence of lanthanides coprecipitated in calcium fluoride powder. Because of the chemical similarity of the lanthanides, they all coprecipitate quantitatively in calcium fluoride, substituting for a calcium ion. Since the lanthanides act as a probe into the immediate crystallographic environment in a host lattice, the analytical technique is termed Selective Excitation of Probe Ion Luminescence (SEPIL). Dissert. Abstr.

N79-33274 Texas A&M Univ., College Station.
ANALYTICAL APPLICATIONS OF ELECTRODE SENSORS Ph.D. Thesis
Hilary Ann Himpler 1979 207 p
Avail: Univ. Microfilms Order No. 7919074

Potentiometric titrimetry using calcium and chloride selective electrodes is investigated and a new conductimetric gas sensor is developed as an alternative to conventional potentiometric gas sensing electrodes. Complexometric titrations of calcium with several amino-carboxylic acid chelating ligands, and precipitation titrations of sodium chloride with silver nitrate are studied. The forms of the various titration curves resulting from titrations of these model chemical systems are developed. A new conductimetric gas sensor is also described and its response characteristics evaluated. Dissert. Abstr.

N79-33275 Texas Univ. at Austin.
ELECTROCHEMICAL REACTIONS IN LIQUID AMMONIA Ph.D. Thesis
Towfik Hassan Teherani 1979 191 p
Avail: Univ. Microfilms Order No. 7920225

The utilization of liquid ammonia as a solvent in the study of electrochemical reductions was investigated. This solvent is relatively inexpensive, easily purified, and can be easily removed following electrosynthesis and is thus very suitable for electrochemical work and vacuum line techniques. The electrogeneration of solvated electrons was investigated by various electrochemical techniques including cyclic voltammetry, coulometry, chromocoulometry, and the single galvanostatic pulse method. A series of halonitrobenzenes was studied and the stability of the radical anion and dianion of the halogenated parent was compared with results obtained in other nonaqueous solvents. The ability of liquid NH3 to stabilize anionic species was demonstrated. The anodic deposition of gold on platinum and copper electrodes in liquid ammonia was also described. Dissert. Abstr.

N79-33276 Arkansas Univ., Fayetteville.
INVESTIGATIONS CONCERNING SOME PROPERTIES OF VIBRATIONAL CARTESIAN NORMAL COORDINATES Ph.D. Thesis
Harrell Lee Sellers 1979 243 p
Avail: Univ. Microfilms Order No. 7919247

Three procedures are presented which demonstrate the utility of vibrational Cartesian normal coordinates in structural chemistry. The first procedure is a method of calculating approximate vibrational mean amplitudes of displacement without the use of refined force fields. In this method Cartesian normal coordinates are obtained from classical vibrational analysis using a standard set of force constant types. Normal coordinate ab initio force relaxation is the second procedure presented and is a method of obtaining ab initio equilibrium molecular structures. In this procedure ab initio Cartesian atomic forces are transformed into vibrational space where an increment in geometry is calculated. The third procedure is a method of calculating vibrational space force constants of higher order than one. This is accomplished by the numeric differentiation of forces in approximate normal coordinate space and subsequent transformation of derivatives into ab initio normal coordinate space. Dissert. Abstr.

N79-33277 Rice Univ., Houston, Tex.
PHOTOELECTROCHEMICAL CHARACTERIZATION OF THE PASSIVE FILMS ON IRON AND NICKEL Ph.D. Thesis
Stanley Mark Wilhelm 1979 131 p
Avail: Univ. Microfilms Order No. 7919644

The semiconducting properties of the passive films on iron and nickel were established through capacitance, photocurrent and kinetic measurements. The passive films on iron and nickel are n-type and p-type oxide semiconductors respectively. Extrinsic conduction in the passive films is due to nonstoichiometry. Ferrous ions in the iron film act as donors in producing n-type conductivity and Ni(+3) acceptor ions in the nickel passive film give rise to p-type conductivity. The band gaps of the anodic films on iron (2.0 eV) and nickel (3.3eV) are close to those expected for Fe2O3 and NiO. Passivation occurs by the formation of a barrier oxide which is photoconductive and partially present even during active dissolution of the metals. Electrochemical oxidation and reduction of ionic species in solution can be correlated with the electronic structure of the passive films. Dissert. Abstr.

N79-33278 Cincinnati Univ., Ohio.
CHARACTERIZATION AND APPLICATIONS OF THE ION EXCHANGE MEMBRANE DETECTOR FOR LIQUID CHROMATOGRAPHY Ph.D. Thesis
John Dorsey 1979 185 p
Avail: Univ. Microfilms Order No. 7922590

Fundamental studies of detector characteristics are presented

as well as application of the detector to the separation and determination of some compounds that are difficult to detect by other methods. The synthesis of an ion exchange membrane with a greater sensitivity than commercially available membranes is reported. This is a polyethylene-polystyrene graft copolymer which is then sulfonated. Various detector cell designs are discussed. The applicability of the detector to the separation and determination of some simple quaternary ammonium compounds is shown. A new liquid chromotographic method for the determination of choline in feeds is described. The results compare favorably with an NMR method while showing considerably better detection limits. The method is also much more reproducible and faster than popular colorimetric methods using ammonium reineckate. Dissert. Abstr.

N79-33279 Michigan State Univ., East Lansing.
THE DESIGN AND CHARACTERIZATION OF A MINIATURE, NANOSECOND SPARK DISCHARGE FOR ANALYTICAL EMISSION SPECTROSCOPY Ph.D. Thesis
Gary Thomas Seng 1979 166 p
Avail: Univ. Microfilms Order No. 7921199

The miniature spark described is an excellent source for the determination of a number of elements including Ca, Al, B, C, Si, P, Mo, Cu and others. Time-resolved studies of the excitation temperature, ionization temperature, electron density, and background emission are presented and discussed. For analytical determinations, the analyte emission line is selected under minicomputer control. Additionally, the minicomputer directs the time-resolution circuitry, acquires emission data, and performs statistical calculations. Dissert. Abstr.

N79-33280 Duke Univ., Durham, N. C.
POLARIZED FLOURESCENCE OF PARTIALLY ORDERED FLUIDS Ph.D. Thesis
Dennis John Reutter 1978 214 p
Avail: Univ. Microfilms Order No. 7922769

Aspects of the structure of partially ordered fluids are studied. Many nematic fluids, in an electric field, undergo an electrohydrodynamic instability at a threshold voltage. A series of semi-quantitative experiments exploring the molecular ordering in the nematic fluid as revealed by polarized fluorescence of dissolved probes is presented. The effect of increasing voltage is the principal factor studied. The theory of polarized fluorescence is extended. Orientational order is described by a truncated series of associated Legendre functions or generalized associated Legendre functions. The novel features incorporated are the use of distribution functions for the relation between the orientation of the emission dipole at the time of emission to the orientation of the absorption dipole at an earlier time, and the relation of both dipoles to the fluorophore structure and to the sample axis. Under appropriate conditions, the theory is shown to reduce to earlier theories. Finally, measurements of polarized fluorescence intensities from doped planar samples of rigid polymers and liquid-crystalline phospholipid multibilayers are analyzed.
Dissert. Abstr.

N79-33281 Colorado Univ. at Boulder.
THE PREDICTION AND INTERPRETATION OF NONLINEAR EFFECTS IN PICOSECOND SPECTROSCOPY Ph.D. Thesis
Kathryn Beth Schieber Greve 1979 211 p
Avail: Univ. Microfilms Order No. 7923242

Techniques of picosecond absorption spectroscopy are utilized to provide a time and wavelength resolved record of the ultrafast photophysical and photochemical processes occurring in optically excited solutions. These techniques and the experimental configurations necessary to perform these investigations are outlined with a particular emphasis on the data acquisition and analysis system. The complications in interpreting picosecond absorption spectroscopy data due to possible nonlinear effects are summarized. Dissert. Abstr

N79-33282 Pennsylvania State Univ., University Park.
THE ION-MOLECULE REACTIONS OF ALKYL SILANES Ph.D. Thesis
George William Goodloe 1979 124 p
Avail: Univ. Microfilms Order No. 7922290

The gas phase reactions of CH3(+) and C2H5(+) with various ethyl and methyl silanes were investigated using a tandem mass spectrometer equipped with an arc discharge source and Wien filter to form the reactant ion beam. As expected, hydride transfer accounted for a major portion of the total product for these systems. A surprising result was the apparent equal probability of direct alkide transfer, either CH3(-) or C2H5(-) to the attacking alkyl cation. Alkide transfer was the main mode of reaction when tetraethylsilane or tetramethylsilane was used as the target gas. Data from isotope experiments indicate very little complex formation in all the systems studied except for CH3(+) reacting with ethyl silanes where it amounts to at most eight percent of the total product. Also investigated were the ion molecule reactions of C3H2(+) and C4H9(+) with various methyl silanes.
Dissert. Abstr.

N79-33283 Northeastern Univ., Boston, Mass.
STUDIES IN HIGH PERFORMANCE LIQUID CHROMATOGRAPHY Ph.D. Thesis
Wei Sen Wong 1979 167 p
Avail: Univ. Microfilms Order No. 7923543

A promising approach to the establishment of high performance conditions using metal chelate additives with chemically bonded n-alkyl stationary phases is presented. In this approach, a relatively hydrophobic chelating agent, 4-dodecyldiethylenetriamine, is added to an acetonitrile/water mobile phase which contains an equimolar of Zn(II) and is buffered at pH of 7.1 with ammonium acetate. Data on the reproducibility of the C12-dien-Zn(II) system and studies of chromatographic parameters, such as the ammonium acetate and acetonitrile concentrations, are presented. Illustrative separations of sulfa drugs, dansyl amino acids, aromatic acids, peptides and monophosphate nucleotides are also shown. An electrochemical detection system that is capable of low pg analysis for liquid chromatography is discussed along with the modification of the chromatographic system for the indirect electrochemical detection of hydroxy compounds. Dissert. Abstr.

N79-33284 Colorado State Univ., Fort Collins.
TRACE ANALYSIS WITH A DIRECT CURRENT PLASMA ECHELLE SPECTROMETER SYSTEM Ph.D. Thesis
Greg Willard Johnson 1979 169 p
Avail: Univ. Microfilms Order No. 7923356

The capabilities and limitations of a commercial d.c. argon plasma, multielement atomic emission spectrometer (DCPMAES) technique for the determination of eighteen elements in water was evaluated. Operational characteristics were investigated in terms of optimum element concentrations for standardization, detection and determination limits, and freedom from interference effects. A critical comparison of two-electrode and three-electrode d.c. plasma systems showed that the latter offers desirable advantages including: a general reduction in background emission with concomitant improvement in signal-to-background ratios, improved long-term stability, and a general increase in operational simplicity. Dissert. Abstr.

N79-33285 Cincinnati Univ., Ohio.
DIRECT MONITORING OF ELECTROCHEMICAL REACTIONS BY NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY Ph.D. Thesis
Daryl Wayne Mincey 1978 153 p
Avail: Univ. Microfilms Order No. 7922612

A spectroscopic analysis technique able to distinguish quite similar species is presented. Cells using thin layers of conductive surfaces, which are radio frequency transparent, are located directly in the sample detection region of the NMR spectrometer. These cells have potential for monitoring organic and biological redox species when inserted into an NMR. Several cell configurations and reference and auxiliary electrode designs are discussed. Methods to increase the rate of electrolysis are investigated. These include efficient mixing of sample and increasing the electrode surface area to sample volume ratio. The ability of these cells to monitor in situ, within the detection volume of the NMR spectrometer, redox reactions is demonstrated.
Dissert. Abstr.

N79-33286 Pennsylvania State Univ., University Park.
CHEMICAL ANALYSIS USING CHEMICAL IONIZATION MASS SPECTROMETRY Ph.D. Thesis
Steven R. Prescott 1979 208 p

Avail: Univ. Microfilms Order No. 7922331

A gas chromatograph-chemical ionization mass spectrometer-computer system modified for both positive ion and negative ion detection was used for the trace analysis of transition metal organometallic and organic compounds. A series of Cr(beta-diketonates)3 were studied in both positive and negative ion detection modes, and it was determined that negative ion chemical ionization mass spectrometry can provide two to three orders of magnitude-increased sensitivity for compounds which promote anion formation over its positive ion counterpart. The presence of ruthenium in doped automobile exhaust particle emission and of manganese(II) as the combustion product of methyl cyclopentadienyl manganese (MMT), an anti-knock agent was investigated. The nature of organic species contained in diesel exhaust particulate emissions was studied. The design of the experiment was novel in that pure hydrocarbon blends were used as fuels in order to simplify the tailpipe chemistry. Dissert. Abstr.

N79-33287 New Mexico Univ., Albuquerque.
DEVELOPMENT OF HIGH-PRESSURE LIQUID CHROMATOGRAPHY TECHNIQUES FOR THE ANALYSIS OF WASTEWATER EFFLUENT Ph.D. Thesis
Glenn Douglas Pierce 1979 139 p
Avail: Univ. Microfilms Order No. 7922874

A biological secondary wastewater effluent was studied by conventional wastewater analysis parameters. The capabilities of activated carbon and macroreticular resin for recovering residual organics from the effluent are evaluated. The conventional parameters are correlated with carbon recoveries. High pressure liquid chromatographic techniques for separation of organics in the recovered mixtures are developed and a selected extract fraction is identified. The carbon and resin extracts were separated and characterized by reverse phase and gel permeation high pressure liquid chromatography. Statistically valid correlations of carbon chloroform extract, nonvolatile total organic carbon and chemical oxygen demand were developed. Dissert. Abstr.

N79-33288*# State Univ. of New York at Stony Brook.
COMBUSTION OF POROUS SOLIDS AT REDUCED GRAVITATIONAL CONDITIONS Final Report
A. L. Berlad and J. Killroy Washington NASA Oct. 1979 110 p refs
(Grant NsG-3051)
(NASA-CR-3197) Avail: NTIS HC A06/MF A01 CSCL 21B

A ground-based experimental and analytic study considered the utility and the feasibility of a space shuttle-based experimental study of the combustion of porous solids at reduced gravitational conditions. This ground-based study employed the Lewis Research Center's g = 0 (drop tower) facility. Experimental g = 1 studies were performed both at the Lewis Research Center and at State University of New York at Stony Brook. It is found that the considered space shuttle-based experimental program is expected to yield vital fundamental combustion information that is not obtainable from earth-bound studies alone. The considered space shuttle-based study is entirely feasible and a detailed approach to these experiments is presented. M.M.M.

N79-33289# California Univ., Berkeley.
TEMPERATURE DEPENDENCE OF VIBRATIONAL RELAXATION IN GAS PHASE WATER AND AMMONIA Final Report, 1 Aug. 1976 - 30 Apr. 1979
Floyd E. Hovis and C. Bradley Moore Jun. 1979 10 p refs
(Contract F49620-76-C-0019; AF Proj. 2308)
(AD-A071908; AFOSR-79-0870TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

Vibrational relaxation measurements are reported on H2(-18)O and from 250 K to 400 K for pure water and for mixtures with He and Ar. The results of vibrational relaxation measurements of NH3 in mixtures of He, Ar, N2, and O2 are reported for the temperature range 198 K to 398 K. GRA

N79-33290# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.
ELECTRICALLY CONTROLLED COLORATION OF MATERIALS Final Report, Jan. 1976 - Mar. 1979
Paul H. Holloway and Rolf E. Hummel Jun. 1979 61 p refs
(Grant DAAG29-76-G-0151)
(AD-A071717; ARO-13056.1-P) Avail: NTIS HC A04/MF A01 CSCL 07/4

This report presents the results of a study of the phenomena of coloration of solid materials by application of electric potentials. Four specific aspects of this subject have been emphasized. First, new electrochromic materials were surveyed. Second, rhenium oxides were studied in detail to determine the origin of their thermochromic effect. Third, the rate-controlling mechanisms in liquid electrolyte cells were investigated. And fourth, various solid-state electrolyte materials were studied and one - termed PSSE - gave improved performance over those previously discussed in the literature. GRA

N79-33291# Oakland Univ., Rochester, Mich. Dept. of Chemistry.
AN ANALYSIS OF THE VIBRATION SPECTRUM OF SYMMETRICALLY SOLUATED ALKALI METAL CATIONS Progress Report, 1 May 1977 - 31 Apr. 1979
Parbury P. Schmidt and B. Stanley Pons 12 Jun. 1979 75 p refs
(Contract N00014-77-C-0293)
(AD-A071391; TR-3) Avail: NTIS HC A04/MF A01 CSCL 07/4

This paper presents the results of a theoretical study of the vibrational spectrum of solvated alkali metal cations in DMSO. The systems are investigated with the use of a potential energy function which consists of an electrostatic and a repulsion term. We show that for systems with simple cubic symmetry there is no dependence in the force constant upon electrostatic terms. Thus, the far infrared spectrum provides a probe of the repulsion interaction which operates in the system. Our study shows that the ions of lithium, sodium, and potassium can be regarded as classical point charges. The far infrared spectra of the ions of rubidium and cesium, on the other hand, depend upon dispersion forces (dispersion is treated with the use of the Morse function). Finally, lithium and sodium may be considered to be trapped inside an infinitely massive solvent cage. For the remaining ions, reduced mass effects must be considered. GRA

N79-33292# Oakland Univ., Rochester, Mich. Dept. of Chemistry.
THE VIBRATIONAL SPECTRUM OF ALKALI METAL CATIONS IN DISTORTED SOLVATION SHELLS: A PREDICTION Progress Report, 1 May 1959 - 31 Apr. 1980
Parbury P. Schmidt 9 Jul. 1979 47 p refs
(Contract N00014-77-C-0239)
(AD-A071392; TR-4) Avail: NTIS HC A03/MF A01 CSCL 07/4

The purpose of this paper is to examine the effect of the distortion of the primary solvation shell upon the vibrations of an ion within this shell. In addition, the effect of an external charge (or image charge) on the vibrations is investigated. We find that distortions (including the presence of an external charge) can cause a splitting of the solution phase far infrared band into two or three new bands. The frequencies of the band maxima depend upon the nature of the solvation shell distortion. It appears that the far infrared vibrational spectrum may prove to be a tool to probe the structure and the intermolecular forces of adsorbed, solvated ions. GRA

N79-33293# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN INVESTIGATION OF FLAME STABILITY IN A COAXIAL COMBUSTOR Ph.D. Thesis
E. T. Curran Jan. 1979 243 p refs
(AF Proj. 3012)
(AD-A070701; AFIT/AE/DS/79-1) Avail: NTIS HC A11/MF A01 CSCL 21/5

An investigation of the flame stability of a coaxial dump combustor was made. A 6.0 inch diameter combustor was studied, and the inlet diameter was varied from 2.5 inch to 5.0 inch. Tests were carried out using pre-mixed ethylene/air and JP-4/air. The inlet temperature levels were generally in the range 1000-1250 R; the corresponding pressure was varied between approximately 10 and 40 psia. Inlet Mach numbers were typically in the range 0.2 to 0.9. The flame stability data were not collapsed by a conventional correlation. A new correlation parameter was derived by modelling the annular recirculation zone as an adiabatic

stirred reactor using a one-step chemical reaction: this parameter gave successful correlations. The dominant variable in flame stability was the inlet temperature. The effect of velocity on the lean limit was small. Some tests were performed with addtional fuel injection directly into the recirculation zone, which yielded an estimate of the air mass flow fraction entrained into the recirculation zone. Finally, tests were performed using a transparent combustor; it was observed that the combustion process was an oscillatory phenomenon. A review of the literature concerning the flame stability and aerodynamics of coaxial combustors is presented. GRA

N79-33294# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
IGNITION OF NF3 WITH HYDROCARBONS AND FLUOROCARBONS
Peter Breisacher and William A. Hicks 7 Jun. 1979 28 p refs Sponsored in part by Naval Sea Systems Command
(Contract F04701-78-C-0079)
(AD-A071121; TR-0079(4725)-2; SAMSO-TR-79-45) Avail: NTIS HC A03/MF A01 CSCL 21/2

The ignition characteristics of NF3 were studied with several hydrocarbons and fluorocarbons at various initial pressures and reactant concentrations. All tests were conducted statically in an instrumented high-pressure reaction vessel with the use of either spark or hot-wire ignition sources. Product gases were analyzed in order to determine combustion efficiency. Ignition delay, over-pressures, and temperature rise were determined for each test. The optimum oxidizer/fuel ratio for the most complete reaction of NF3 was determined for mixtures of NF3 and C2H4; NF3 and 1, 3 -C4H6; NF3 and C5H6; and NF3 and C2H2F2. The feasibility of using N2F4 as an injected additive for firing spontaneously spark-ignitable mixtures of NF3 and C2H4 at concentrations of up to 10% N2F4 in helium was investigated with negative results. GRA

N79-33295# Army Mobility Equipment Research and Development Command, Fort Belvoir, Va.
DETERMINATION OF BRANCHED CHAIN KETONES IN COATING SOLVENTS Progress Report, Apr. 1978 - Mar. 1979
Troy Nichols, George Svarnas, and Robert E. Thomas May 1979 21 p
(AD-A071925; MERADCOM-2276) Avail: NTIS HC A02/MF A01 CSCL 07/3

This report covers the development of and results obtained with an analytical procedure to detect and determine the branched chain ketones: methyl isobutyl ketone (MIBK), methyl isoamyl ketone (MIAK), mesityl oxide (MO), and isophorone in paint solvents. Two spot tests, a 2,4-dinitrophenylhydrazine separation and a quantitative gas-liquid chromatographic (GLC) technique, are used. GRA

N79-33296# Mason and Hanger-Silas Mason Co., Inc., Amarillo, Tex. Development Div.
ANALYSIS OF PBX 9501 BY HIGH SPEED LIQUID CHROMATOGRAPHY
A. C. Teter Mar. 1979 7 p
(Contract DE-AC04-76DP-00487)
(MHSMP-79-23) Avail: NTIS HC A02/MF A01

Relative standard deviations for the major components described were less than 4%. Separation was made on a 50 cm x 2.6 mm ID amino Sil-X column. A mixture of 80% tetrahydrofuran and 20% isopropanol was used for the mobile phase. Analysis run time was 5.5 minutes. Detection was via ultraviolet spectrometer at 220 nm. A separation of the nitroplasticizer components was also accomplished using a different mobile phase solvent combination. DOE

N79-33297# National Bureau of Standards, Washington, D. C.
TRACE ORGANIC ANALYSIS: A NEW FRONTIER IN ANALYTICAL CHEMISTRY Final Report
Harry S. Hertz and Stephen N. Chesler Apr. 1979 788 p Presented at the 9th Mater. Res. Symp., Gaithersburg, Md., 10-13 Apr. 1978
(PB-296978/0; NBS-SP-519; LC-79-600061) Avail: NTIS HC A99/MF A01 CSCL 07D

Topics covered are: Sampling and Sampling Handling for Trace Organic Analysis, State-of-the-Art Analytical Systems, Analytical Techniques on the Horizon, Analysis of Nutrients, Analysis of Organic Pollutants and Their Metabolites in the Ecosystem, Analysis of Drugs in Body Fluid, Analysis of Food Toxicants, and Analysis of Hormones and Neuro-transmitters. GRA

N79-33298# Environmental Monitoring and Support Lab., Cincinnati, Ohio.
METHODS FOR CHEMICAL ANALYSIS OF WATER AND WASTES Final Report
John F. Kopp and Gerald D. McKee Mar. 1979 490 p refs
(PB-297686/8; EPA-600/4-79-020) Avail: NTIS HC A21/MF A01 CSCL 07D

Analytical procedures used for the examination of ground and surface waters, domestic and industrial waste effluents, and treatment process samples are presented. Except where noted, the methods are applicable to both water and wastewaters, and both fresh and saline water samples. Test procedures for the measurement of physical, inorganic, and selected organic constitutents and parameters are provided. GRA

N79-33299# National Bureau of Standards, Washington, D. C.
JOURNAL OF RESEARCH OF THE NATIONAL BUREAU OF STANDARDS, VOLUME 84, NO. 2, MARCH-APRIL 1979 Bimonthly Report
1979 80 p refs
(PB-296439/3; LC-62-37059) Avail: NTIS HC A05/MF A01 CSCL 07D

Contents: A novel method for analyzing silver sediment with high precision; Psychrometric wet element as a bias for precise physico-chemical measurements; Non-free groups generated by two parabolic matrices. GRA

N79-33300# Joint Inst. for Lab. Astrophysics, Boulder, Colo.
BIBLIOGRAPHY OF LOW ENERGY ELECTRON AND PHOTON CROSS SECTION DATA Report, Jan. 1975 - Dec. 1977
J. W. Gallagher, J. R. Rumble, Jr., and E. C. Beaty Jun. 1979 118 p refs
(PB-296736/2; NBS-SP-426-Suppl-1; LC-78-600156) Avail: NTIS HC A06/MF A01 CSCL 07D

Reports of measurements or calculations of electron, positron, and photon cross sections for atoms, small molecules, and their ions is presented. A detailed index to the bibliography facilitates retrieval of cross section data for specific processes and associated atomic or molecular species. A comprehensive author index is included. The bibliography covers the calendar years 1975-1977. This work supplements a previous bibliography which covered the literature through 1974. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N79-33301 Polytechnic Inst. of New York.
LOW CYCLE FATIGUE BEHAVIOR OF Ti-6Al-2Sn-4Zr-6Mo ALLOY Ph.D. Thesis
Yashwant Ramchandra Mahajan 1979 220 p
Avail: Univ. Microfilms Order No. 7920789

The program was undertaken to investigate the low cycle fatigue (LCF) behavior of an alpha-Beta Ti-6Al-2Sn-4Zr-6Mo alloy. The alloy was solution heated and aged to obtain an equiaxed (E-alpha) and Widmanstatten plus grain boundary alpha(W+G.B. alpha) structures, having yield strengths of 170 ksi, and 160 ksi respectively. The fatigue life curves having been determined in smooth bar specimens under total strain control (R=1) with Delta epsilon tau sub 2 ranging from 0.65% to 3.2%. The effect of morphology alpha particle size and prior Beta grain size on LCF behavior was studied. As part of a program, slip line studies (under monotonic loading) were conducted. Dissert. Abstr.

N79-33302 Rochester Univ., N. Y.
A NUCLEAR MAGNETIC RESONANCE INVESTIGATION OF PARAMAGNETIC METAL COMPLEXES IN THE SOLID

STATE Ph.D. Thesis
Thomas Craig Sandreczki 1979 296 p
Avail: Univ. Microfilms Order No. 7922963

A number of copper amino acid complexes and transition metal porphyrin complexes were synthesized and subsequently examined by nuclear magnetic resonance (nmr) spectroscopy at a number of temperatures near 4.2 K. The samples were typically examined as fine powders except for the case of trans-bis-D,L-alaninatocopper(II) monohydrate which was a single crystal. The nmr investigations were conducted to experimentally determine isotropic hyperfine coupling constants for the various hydrogen atoms contained in these complexes. In some cases it was also possible to determine effective metal-hydrogen distances in the complexes. Dissert. Abstr.

N79-33303 Dartmouth Coll., Hanover, N.H.
TEMPERATURE DEPENDENCE OF THE OPTICAL CONSTANTS OF THE NOBLE METALS Ph.D. Thesis
Geoffrey Richard Parkins 1979 201 p
Avail: Univ. Microfilms Order No. 7921594

The real and imaginary parts of the dielectric constants, epsilon, and epsilon sub 2, were determined for the noble metals (Cu, Ag, and Au), over the proton energy range 0.5 to 6.5 eV, at temperatures 78K, 295K, and 425K. Reflection and transmission measurements were made on vacuum evaporated opaque and semitransparent thin films. A numerical inversion technique was used to obtain the optical constants, n and k. The dielectric constant epsilon sub 2, was analyzed using predictions from two models, one for the contribution to epsilon sub 2 from interband transitions. The intraband contribution used the sum of the electron photon scattering frequency and the electron electron scattering frequency to explain the observed temperature and frequency dependence of the scattering frequency. Dissert. Abstr.

N79-33304# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CORROSION INFORMATION IN NATO NATIONS
N. E. Promise Jul. 1979 36 p refs
(AGARD-AR-141; ISBN-92-835-1327-4) Avail: NTIS HC A03/MF A01

Research was performed to: (1) determine the needs of the NATO aerospace industry and related Government establishments for technical data relevant to corrosion principles, material behavior in hostile environments, corrosion prevention, etc.; (2) to determine what national and international resources exist that could be responsive to these needs and what were the facilities for collecting, analyzing, coding, storing and retrieving the desired information; and (3) to suggest approaches to filling identified gaps and unsatisfied needs. The study was limited to the generic types of information needed and the mechanics of transferring this information. M.M.M.

N79-33305*# Westinghouse Astronuclear Lab., Pittsburgh, Pa.
INTERDIFFUSION BEHAVIOR OF TUNGSTEN OR RHENIUM AND GROUP 5 AND 6 ELEMENTS AND ALLOYS OF THE PERIODIC TABLE. PART 2B: APPENDICES Final Report
F. G. Arcella Sep. 1974 261 p refs
(Contract NAS3-13231)
(NASA-CR-134526; WANL-M-FR-74-005-Pt-2) Avail: NTIS HC A12/MF A01 CSCL 11F

The following are appended: (1) The Hartley Computer Program; (2) The Lifshin Computer Program; (3) Modification of the Colby Magic Program for Quantitative Electron Microprobe Analysis; and (4) Error and Correction Analysis. M.M.M.

N79-33306*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME TEM OBSERVATIONS OF Al2O3 SCALES FORMED ON NiCrAl ALLOYS
J. Smialek and R. Gibala (Case Western Reserve Univ., Cleveland, Ohio) 1979 34 p refs Presented at Gordon Conf. on Corrosion, New London, N. H., 23-27 Jul. 1979
(NASA-TM-79259; E-171) Avail: NTIS HC A03/MF A01 CSCL 11F

The microstructural development of Al2O3 scales on NiCrAl alloys has been examined by transmission electron microscopy. Voids were observed within grains in scales formed on a pure NiCrAl alloy. Both voids and oxide grains grew measurably with oxidation time at 1100 C. The size and amount of porosity decreased towards the oxide-metal growth interface. The voids resulted from an excess number of oxygen vacancies near the oxidemetal interface. Short-circuit diffusion paths were discussed in reference to current growth stress models for oxide scales. Transient oxidation of pure, Y-doped, and Zr-doped NiCrAl was also examined. Oriented alpha-(Al, Cr)2O3 and Ni(Al, Cr)2O4 scales often coexisted in layered structures on all three alloys. Close-packed oxygen planes and directions in the corundum and spinel layers were parallel. The close relationship between oxide layers provided a gradual transition from initial transient scales to steady state Al2O3 growth. M.M.M.

N79-33307# Boeing Commercial Airplane Co., Seattle, Wash.
STANDARDIZATION OF Ti-6Al-4V PROCESSING CONDITIONS Final Technical Report, 15 Jun. 1975 - 31 Jul. 1978
R. R. Boyer and R. Bajoraitis Wright-Patterson AFB, Ohio AFML Sep. 1978 166 p refs
(Contract F33615-74-C-5176; AF Proj. 7381)
(AD-A071542; D6-48016; AFML-TR-78-131) Avail: NTIS HC A08/MF A01 CSCL 11/6

The effects of microstructure, composition, and crystallographic texture on the mechanical, fracture, and fatigue properties of Ti-6Al-4V sheet and plate were evaluated. This program was directed toward defining the processing approach for both product forms that provides the best damage-tolerance characteristics for fracture-critical applications. Specifications were written for premium-grade damage-tolerant Ti-6Al-4V sheet and plate defining processing, and mechanical, and fracture property requirements. The sheet and plate material was produced in accordance with the proposed specifications and characterized. Tensile, fracture toughness, stress-corrosion resistance, fatigue, and fatigue crack propagation (air and salt water) properties were generated. Testing variables incorporated in the fatigue tests included R ratio (0.05, 0.5, and -1), and test orientation (L-T and T-L). Variables in fatigue crack propagation tests included environment (air and salt water), R ratio (0.05 and 0.5), and frequency (6 and 60 cpm). Material and heat treatment (microstructural) variables included variations in oxygen content, crystallographic texture, mill annealing (covering the extremes in time and temperature ranges allowed per MIL-H-81200), duplex-annealing (with air cooling and furnace cooling), and beta-annealing. The results of the tests are presented in tabular and graphical form, for individual specimens and specimen groups. Comparisons to mill-annealed and recrystallization-annealed material are made. The effects of the various material and test variables on the pertinent properties are discussed. GRA

N79-33308# Aluminum Co. of America, Alcoa Center, Pa. Alcoa Labs.
FACTORS INFLUENCING FRACTURE TOUGHNESS AND OTHER PROPERTIES OF ALUMINUM-LITHIUM ALLOYS Final Report
T. H. Sanders, Jr. 14 Jun. 1979 282 p refs
(Contract N62269-76-C-0271)
(AD-A071669) Avail: NTIS HC A13/MF A01 CSCL 11/6

An investigation was made to identify the microstructural features which control the fracture behavior of Al- Li alloys. Tensile, fracture toughness, and selected fatigue tests were conducted on candidate Al- Li alloys Al- Mc- Li, Al- Cu- Li, and Al- Li. In all three alloy systems and most aging conditions investigated, the fracture mode was low energy, integranular failure. Three microstructural features were considered to correlate with the intergranular failure--the shearable nature of the coherent Al3 Li delta' precipitates which leads to dislocation pile-ups at the grain boundaries the growth of a solute depleted, precipitate free zone during aging, and the occurrence of the tramp elements sodium, potassium and sulfur presumably segregated in the grain boundaries. Furthermore, the hydrogen content of the alloys was also shown to be significantly higher than other high strength commercial alloys. All these features would contribute to the low toughness and would tend to promote intergranular failure. GRA

N79-33309# Naval Research Lab., Washington, D. C.
THE SCC PROPERTIES OF MODIFIED HIGH-STRENGTH STEEL PLATES AND WELD METALS Final Report, 1 Oct. 1977 - 30 Sep. 1978
C. T. Fujii 17 Jul. 1979 17 p refs
(AD-A071785; NRL-8325) Avail: NTIS HC A02/MF A01 CSCL 11/6

This report describes the results of baseline studies on the effects of chemical, metallurgical, and mechanical factors on the SCC properties of high-strength steels and weldments. The primary materials were quench-and-tempered steels or weld metals in the HY-100 and HY-130 systems with complex martensitic microstructures. The cantilever beam method was used to measure K sub Iscc of the materials in 3.5% sodium chloride (NaCl) solution under zinc-coupled conditions. This parameter was utilized to rank the materials and to evaluate the effects of processing, welding procedure, and tempering on SCC properties. GRA

N79-33310# Battelle Columbus Labs., Ohio.
INVESTIGATING LOCALIZED CORROSION AND SPUTTERING FEASIBILITY OF AMORPHOUS CHROMIUM-COATING ALLOYS Interim Technical Report, 1 May 1977 - 30 Apr. 1979
R. B. Diegle and D. M. Lineman May 1979 82 p refs
(Contract N00014-77-C-0488)
(AD-A071816) Avail: NTIS HC A05/MF A01 CSCL 11/6

For the past two years research has been directed toward understanding and utilizing the corrosion resistant properties of amorphous alloys based on the composition Fe-Ni-Cr-P-B. The research had two objectives: (a) separating initiation from propagation stages of localized corrosion phenomena and characterizing the tendency for each; and (b) developing a sputtering technique as a means for preparing these alloys. Propagation of localized corrosion was studied in prepared crevices, which circumvented the need for initiation at structural heterogeneities at alloy surfaces. A series of amorphous alloys with chromium contents ranging from 0 to 16 atomic percent was investigated. Classical anodic polarization experiments in acidified chloride electrolytes indicated that the chromium-containing alloys were extremely passive, pitting occurring only above about 1 V(SCE) in 1 M NaCl at pH 1. The existence of classical active-passive polarization behavior suggested that the susceptibility of these alloys to crevice corrosion would be considerably less than that of crystalline stainless alloys, such as Type 304 and Incoloy 800 steels. Experiments in the crevice cells indicated that the amorphous alloys do crevice corrode, but only at very noble potentials comparable to those required for pitting. The sputtering research resulted in a procedure for depositing amorphous alloys with corrosion resistance almost as good as that conferred by liquid quenching. GRA

N79-33311# Pennsylvania Univ., Philadelphia.
MECHANICAL AND MAGNETIC PROPERTIES OF AMORPHOUS ALLOYS Final Report, 23 Apr. 1976 - 22 Apr. 1979
T. Egami and C. D. Graham, Jr. Jun. 1979 9 p refs
(Contract DAAG29-78-C-0017; Grant DAAG29-76-G-0220)
(AD-A071846; ARO-13713.3-MSX) Avail: NTIS HC A02/MF A01 CSCL 11/6

This report presents a summary of a study of amorphous alloys. The study included temper embrittlement of amorphous alloys, creep measurements with a magnetic probe, structural studies, and a computer simulation of the structural defects. GRA

N79-33312# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
MARINE GAS TURBINE HOT CORROSION DEPENDENCE ON INGESTED SALT LEVELS Final Technical Report, 29 Jul. 1977 - 31 Oct. 1978
R. H. Barkalow and F. S. Pettit 16 Apr. 1979 110 p refs
(Contract N00173-77-C-0206)
(AD-A071055; PWA-FR-11544) Avail: NTIS HC A06/MF A01 CSCL 21/5

Turbine section hardware in marine engines is susceptible to hot corrosion attack induced by salt deposition. In attempting to control this type of materials degradation, it is necessary to examine the dependence of hot corrosion on ingested salt level and to determine the deposition rate below which hot corrosion attack will be negligible. Test specimens (uncoated and aluminized Mar-M509 and IN792, CoCrAlY-coated IN 792) were exposed at 700 and 900 C in laboratory tube furnaces to conditions which induce hot corrosion attack. The microstructures developed in these tests were compared with those observed in service hardware. A test at 700 C with a salt deposit of sodium sulfate, either pure or mixed with metallic sulfates, and a gaseous environment of oxygen with approximately .0001 atm SO3 was found to most closely duplicate the degradation microstructure most common in hardware from marine service. Results support the hypothesis that any condensed salt deposit is likely to produce unacceptable hot corrosion and hence the only safe ingestion level is that which produces no salt deposition on turbine hardware. GRA

N79-33313# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
EFFECTS OF HELIUM-, IRON-, AND PLATINUM- ION IMPLANTATION ON THE PERMEATION OF HYDROGEN THROUGH IRON MEMBRANES Progress Report
M. Zamanzadeh, A. Allam, J. W. Pickering, and G. K. Hubler (NRL, Washington, D. C.) Jul. 1979 29 p refs
(Contract N00014-75-C-0264)
(AD-A071595; TR-10) Avail: NTIS HC A03/MF A01 CSCL 11/6

A preliminary study was made of the effect of various ions implanted in iron on the absorption of hydrogen by Ferrovac-E iron. Using the permeation technique, it was found that the location of implanted Pt, as modified by selective dissolution of iron from the surface, affects the kinetics of the hydrogen evolution reaction and, hence, of the hydrogen absorption process. The rate of hydrogen absorption decreased with increase in Pt concentration on the surface in both 0.1N NaOH and 0.1N H2SO4. A catalytic mechanism is proposed to explain the marked reduction in hydrogen permeation. There are no significant differences in the permeation behavior of unimplanted and helium- or iron-implanted iron membranes in 0.1N NaOH. The experimentally observed Tafel slope, the permeation-charging potential relationship, and the permeation-charging current relationship indicate a coupled discharge-recombination mechanism of hydrogen evolution on He-, Fe- or Pt-implanted iron. At higher cathodic overpotentials in 0.1N NaOH, corresponding to potentials more negative than -1.0V (SHE), another mechanism of hydrogen evolution is indicated. Selective dissolution of iron from the Pt-implanted Fe surface layer is indicated by Rutherford backscattering analyses to involve diffusion of Pt into the iron ahead of the receding surface. GRA

N79-33314# American Univ., Washington, D. C. Dept. of Chemistry.
AN EXPLORATORY STUDY OF INHIBITION OF INTERGRANULAR STRESS CORROSION CRACKING IN SENSITIZED TYPE 304 STAINLESS STEEL Final Technical Report
B. F. Brown, C. S. ODell, and R. T. Foley Apr. 1979 153 p refs
(Contract AT(49-24)-0185)
(PB-294442/9; NUREG-CR-0754) Avail: NTIS HC A08/MF A01 CSCL 11F

The service background to the intergranular stress corrosion cracking (IGSCC) problem in boiling water reactors (BWRs) is summarized in order to bring the problem into focus, and the technical background to the basic phenomenon is given, in part to establish nomenclature for the reader who may not be conversant with the SCC process. The possible means for mitigating IGSCC are numerous, and many of these have been or are being tested by industry, with the result that some of them have already been adopted as may be appropriate to status (i.e., whether in design, in construction, or in service). The possibility of preventing SCC by the addition of inhibitors stable up to BWR temperatures is investigated in the present study as an exploratory study. GRA

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N79-33315 Rensselaer Polytechnic Inst., Troy, N. Y.
HEAT CAPACITIES OF LINEAR MACROMOLECULES Ph.D. Thesis
Umesh Chandra Gaur 1979 724 p
Avail: Univ. Microfilms Order No. 7922230

Research is presented in an attempt to correlate the heat capacity of linear macromolecules to their chemical and macroscopic structures. The glassy, amorphous linear macromolecules have higher heat capacity then crystalline linear macromolecules. This excess heat capacity can be related to changes in intermolecular skeletal vibrations, unfreezing of gauche-trans conformational equilibrium and non-acoustic low frequency modes of vibrations in glassy, amorphous linear macromolecules. In crystalline state, the additivity of the heat capacity with chaning skeletal atoms is dependent on the crystal structure. The heat capacity would only be chemical structure dependent if the macroconformation are not drastically changed. The presence of large sequences of CH2 groups leads to similar macroscopic structures which causes the heat capacity of hetero skeletal groups to be similar to the CH2 group. Dissert. Abstr.

N79-33316* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MIXED DIAMINES FOR LOWER MELTING ADDITION POLYIMIDE PREPARATION AND UTILIZATION Patent
Terry L. StClaire, inventor (to NASA) Issued 28 Aug. 1979 5 p Filed 6 Oct. 1977 Supersedes N78-18218 (16 - 08 p 1002)
(NASA-Case-LAR-12054-1; US-Patent-4,166,170; US-Patent-Appl-SN-839963; US-Patent-Class-528-229; US-Patent-Class-428-474; US-Patent-Class-264-137) Avail: US Patent and Trademark Office CSCL 07D

A novel addition polyimide based on the use of liquid monomers is described. The essentially solventless prepreg produced retails good drape, tack, and other mechanical properties.

Official Gazette of the U.S. Patent and Trademark Office

N79-33317 Polytechnic Inst. of New York.
STUDY OF THE INTERPENETRATION OF POLYMER CHAINS BY NONRADIATIVE ENERGY TRANSFER Ph.D. Thesis
Farouk Amrani 1979 183 p
Avail: Univ. Microfilms Order No. 7920767

Nonradiative energy transfer in systems containing polymers labeled with donor and/or acceptor chromophores and their low molecular weight model compounds was measured by a reflectance fluorescence technique. The energy transfer efficiency from the donor 1-(2 naphthyl) ethyl acetate, to the acceptor 1-(2 anthryl)ethyl acetate, was characterized by the relative emission intensity at 336 and 408 nm, the emission maxima of the naphthyl and anthryl chromophores, when the system was irradiated in the naphthyl absorption band at 276 nm. The critical distance corresponding to 50% energy transfer was 58.9 A, in dioxane solution, much higher than 21.1 A determined from spectral data by Forster's theory. This was attributed to the mutual diffusion of the donor and acceptor molecules during the lifetime of the donor excited state. Dissert. Abstr.

N79-33318 Polytechnic Inst. of New York.
STUDIES ON POLYSULFIDE POLYMERS MADE FROM SULFUR AND CERTAIN OLEFINIC SYSTEMS Ph.D. Thesis
Binoy Kumar Bordoloi 1979 155 p
Avail: Univ. Microfilms Order No. 7920770

The conversion of sulfur to polysulfide polymers by the reaction of liquid sulfur at 140 C with certain olefinic systems, characterization of these polymers, and the determination of some structure-property relationships is described. The olefinic systems chosen are dicyclopentadiene, which is a rigid and bulky olefin, and oligomeric alkenyl polysulfide, which is a flexible olefinic system readily soluble in liquid sulfur. NMR spectroscopy was used for the determination of chemical and stereochemical structure, and polysulfide distribution; IR spectroscopy for the structure analysis and molecular weight determination; VPO for M sub n; DSC for the determination of glass transition temperature and sulfur crystallization; and tensile testing (Instron) for the evaluation of mechanical properties and chemical stress relaxation time. Dissert. Abstr.

N79-33319 Massachusetts Univ., Amherst.
PREPARATION AND EVALUATION OF EXACTLY ALTERNATING SILARYLENE-SILOXANE POLYMERS Ph.D. Thesis
Petar Radivoj Dvornic 1979 213 p
Avail: Univ. Microfilms Order No. 7920839

Synthetic procedures for preparation of exactly alternating silarylene-siloxane polymers were developed. The condensation polymerization reactions were based on the use of arylenedisilanols and reactive bisureidosilanes as monomers. Preparations of monomers, polymerization procedure and methods for monitoring the reaction are described. Thermogravimetric analysis and controlled pyrolysis were used to investigate the thermal and thermooxidative degradation and stability of these polymers. Intermediates and products of these reactions were analyzed by elemental analysis and gas chromatography. Although different degradation mechanisms apparently operated in two atmospheres, all of the polymers showed extremely high stability which along with their low glass transition temperatures, suggests they may be useful new technological materials. Dissert. Abstr.

N79-33320 University of Southern Mississippi, Hattiesburg.
THE SYNTHESIS AND CHARACTERIZATION OF CONTROLLED ACTIVITY POLYMERS FOR RELEASE OF PENDENT PESTICIDES Ph.D. Thesis
Mike Mehdi Fooladi 1979 352 p
Avail: Univ. Microfilms Order No. 791964

Polymers containing pendent herbicides such as 4-amino-6(1, 1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one or metribuzin, 2,4-dichlorophenoxyacetic acid, 2,2-dichloropropionic acid, trichloroacetic acid, and 4,6-dinitro-2-sec-butylphenol were synthesized and characterized. The structural properties of the described compounds were determined by IR, NMR, and elementary analysis. Macromolecular properties such as molecular weight were determined by membrane osmometry. Urea, ester, amide, imide, and anhydride polymerto-herbicide bonds were prepared for release studies. Herbicide release for each pendent system was studied and is discussed in relation to molecular structure and molecular weight. Dissert. Abstr.

N79-33321 Massachusetts Univ., Amherst.
RHEOLOGY AND RHEO-OPTICS OF CONCENTRATED SOLUTIONS OF HELICAL POLYPEPTIDES Ph.D. Thesis
Gabor David Kiss 1979 328 p
Avail: Univ. Microfilms Order No. 7920857

Concentrated m-cresol solutions of poly-gamma-benzyl-glutamate, poly-epsilon-carbobenzylozy-L-lysine, and poly-beta-benzyl-aspartate were the subjects of rheological and rheo-optical investigation. Study shear viscosity and first normal stress difference were measured in a cone-and-plate rheometer. Dynamic viscosity and dynamic storage modulus were measured via oscillatory shear and eccentric rotating disc. Photomicrographs during shear were obtained by use of a shearing stage and polarized stroboscopic illumination. Dried films made from sheared drops of concentrated solutions of a volatile solvent were also investigated. Dissert. Abstr.

N79-33322 West Virginia Univ., Morgantown.
POLYMERS DESIGNED TO CHELATE CERTAIN METALS SELECTIVELY Ph.D. Thesis
Darrell Glenn Kirchner 1979 155 p
Avail: Univ. Microfilms Order No. 7920714

Polymers that selectively bind to Fe(III), Cu(II) and Hg(II) were designed and polymerized. Dissert. Abstr.

N79-33323 Wisconsin Univ. - Madison.
RHEOLOGY OF SOME SYNTHETIC AND BIOLOGICAL POLYMER NETWORKS Ph.D. Thesis
Gary William Nelb 1978 180 p
Avail: Univ. Microfilms Order No. 7916573

The shear creep and creep recovery behavior of a biological network formed by the in vitro clotting of purified solutions of both human and bovine fibrinogen are reported as a function of the clot type, time elapsed since clotting (clot age), and the fibrinogen concentration. The structure of fine clots is proposed as a sterically hindered, randomly interpenetrating array of stiff, rod-like fibrils. The strength and elasticity of the network are contributed mainly by the bending resistance of the fibrils. The motions of the highly entangled styrene-butadiene random copolymer SBR molecules within the crosslinked network were studied by stress relaxation experiments in simple extension over nearly 9 decades of reduced time. The moduli for the unattached macromolecules all have a plateau value which is in good agreement with the modulus values for the bulk uncrosslinked SBR when corrected for the difference in the number of entanglements. Dissert. Abstr.

N79-33324 Rensselaer Polytechnic Inst., Troy, N. Y.
PLASTICATING BEHAVIOR OF SOLID POLYMERS AT PROCESSING CONDITIONS: EXPERIMENTAL AND THEORETICAL STUDY Ph.D. Thesis
Eldridge Milford Mount, III 1979 359 p
Avail: Univ. Microfilms Order No. 7922234

An experimental and theoretical investigation of the plasticating (transformation of crystalline or amorphous solids to melts) behavior of high density polyethylene, low density polyethylene, polypropylene, polyoxymethylene, polystyrene, polymethylmethacrylate polycarbonate and ice was performed for a wide range of processing variables (temperature, velocity, sample width and applied load). The experimental investigation was performed with molded samples using an apparatus, the screw simulator, especially designed to simulate the observed plasticating mechanism of single screw extruders. This study employs conditions of temperature, velocity and applied load expected in actual extrusion equipment and the uses a wide variety of polymeric materials. Dissert. Abstr.

N79-33325*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLASMA-SPRAYED ZIRCONIA GAS PATH SEAL TECHNOLOGY: A STATE-OF-THE-ART REVIEW
Robert C. Bill 1979 17 p refs Presented at the Manufacturing Technol. Advisory Rev., Phoenix, Ariz., 21-25 Oct. 1979; sponsored by the Soc. of Manufacturing Engr.
(NASA-TM-79273; AVRADCOM-TR-79-47; E-9941) Avail: NTIS HC A02/MF A01 CSCL 11A

The benefits derived from application of ceramic materials to high pressure turbine gas path seal components are described and the developmental backgrounds of various approaches are reviewed. The most fully developed approaches are those employing plasma sprayed zirconium oxide as the ceramic material. Prevention of cracking and spalling of the zirconium oxide under cyclic thermal shock conditions imposed by the engine operating cycle is the most immediate problem to be solved before implementation is undertaken. Three promising approaches to improving cyclic thermal shock resistance are described and comparative rig performance of each are reviewed. Advanced concepts showing potential for performance improvements are described. A.K.L.

N79-33326# Southwest Research Inst., San Antonio, Tex.
COMPRESSIVE STRENGTH AND INDENTATION DAMAGE IN CERAMIC MATERIALS Technical Report, 31 May 1978 - 31 May 1979
James Lankford, Jr. and David L. Davidson 31 May 1979 54 p refs
(Contract N00014-75-C-0668)
(AD-A071892) Avail: NTIS HC A04/MF A01 CSCL 11/2

The threshold loads and crack sizes for indentation cracking were investigated for a number of ceramics using scanning electron microscopy and acoustic emission. It was found that the cracking behavior could be predicted, using a fracture mechanics/dimensional analysis approach modified to take into account the stress field at an elastic-plastic indentation. Selected area electron channeling was used to characterize the extent of subsurface damage produced in ceramics during grinding and polishing operations. It was found that polishing damage depths can be correlated using a simple model based on a sliding elastic-plastic indenter. Finally, the effect of temperature and strain rate upon material removal and cracking threshold was analyzed, using recent experimental compressive strength and crack growth measurements as inputs to current predictive models. The results are shown to have surprising implications with regard to dynamic, high temperature indentation (particle impact). GRA

N79-33327# Army Materials and Mechanics Research Center, Watertown, Mass.
PHASE RELATIONSHIPS AND REACTION SINTERING OF TRANSPARENT CUBIC ALUMINUM OXYNITRIDE SPINEL Final Report
James W. McCauley and Normand D. Corbin May 1979 19 p refs
(DA Proj. 1L1-61102-AH-42)
(AD-A071801; AMMRC-TR-79-24) Avail: NTIS HC A02/MF A01 CSCL 11/2

A new isobaric, condensed phase diagram in the region of stability of cubic aluminum oxynitride spinel (ALON) along the pseudobinary Al2O3-AlN composition join is presented, deduced primarily from various analytical measurements and microstructural observations. It is shown that cubic aluminum oxynitride spinel melts incongruently at about 2050 C and is compositionally centered at about 35.7 mole % AlN which is equivalent to the following stoichiometric composition: Al23O27N5 or 5 AlN.9 Al2O3. Single-phase ALON material sintered to nearly full density exhibits transparency in visible light. GRA

N79-33328# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
ISOTHERMAL WEIGHT LOSS AND LIFE EXPECTANCY CURVES OF POLYMERS IN AIR Final Report, May 1974 - Jan. 1978
Gerhard F. L. Ehlers Jun. 1978 109 p
(AF Proj. 2419)
(AD-A070541; AFML-TR-78-63) Avail: NTIS HC A06/MF A01 CSCL 11/9

Sixty-five polymers have been subjected to isothermal aging in air for up to 200 hours at one or several temperatures of 500, 550, 600, 650, 700, and 750 F and the weight loss-time curves plotted. The data have been used to obtain life expectancy plots for 20 and for 30% weight loss. GRA

N79-33329# Princeton Univ., N. J.
EXCITATIONS AND METASTABILITY IN AMORPHOUS SEMICONDUCTORS Dept. of Physics.
D. C. Licciardello, D. L. Stein, and F. D. M. Haldane (Inst. Laue-Langevin) 28 Jun. 1979 29 p refs Submitted for publication
(Contract N00014-77-C-0711; Grant NSF DMR-78-03015)
(AD-A070807) Avail: NTIS HC A03/MF A01 CSCL 20/5

The Anderson negative-U model for diamagnetic glasses is studied. The optical and thermodynamic excitations are evaluated for equilibriated and non-equilibriated systems. The model is generalized to include non-local phonons and these are shown to lead to new low energy processes which may be important for thermodynamic properties. GRA

N79-33330# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
RELATIONSHIPS BETWEEN MECHANICAL BEHAVIOR AND CRAZE MORPHOLOGY IN THIN FILMS POLYSTYRENE Interim Report
J. S. Trent, I. Palley, and E. Baer 20 Jun. 1979 39 p
(Contract N00014-75-C-0795)
(AD-A070670; TR-9) Avail: NTIS HC A03/MF A01 CSCL 11/9

A new technique has been developed to study the relationship between mechanical properties and craze microstructure in thin films (1-10 micrometers of polystyrene. These thicknesses allowed us to strain the films in a conventional testing machine and subsequently examine them in the deformed state in an electron microscope. Strain rate was systematically varied and its effect was investigated on both quenched and annealed samples correlations were found between craze morphology and ductility. A new 'craze parameter' fundamental to our theoretical interpretation has been defined as the width of a strip of material which is involved in the development of a craze. From this value, the

average strain and the average volume fraction of fibrils within a craze can be calculated. In order to obtain a mechanistic model which is consistent with observed data, a changing relative local strain rate during craze formation had to be assumed. GRA

N79-33331# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Macromolecular Science.
FERROELECTRIC POLYMERS Final Report, 1973 - 1976
Morton H. Litt 1 Jun. 1979 13 p refs
(Contract N00014-67-A-0404)
(AD-A070674) Avail: NTIS HC A02/MF A01 CSCL 11/9

Polybenzimidazoles were studied as potential ferroelectric polymers after a model, 2-ethylbenzimidazole, was shown to be ferroelectric. Three polymers were studied as the formate salts. They were interesting and showed large polarization, but were not pyroelectric or ferroelectric. One polymer may be antiferroelectric with T(c) = 40 C. Nylon 11 was shown to be polable and was then pyroelectric. GRA

N79-33332# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
SEEKING LOW ICE ADHESION
John M. Sayward Apr. 1979 87 p refs
(DA Proj. 4A7-62730-AT-42)
(AD-A071040; CRREL-SR-79-11) Avail: NTIS HC A05/MF A01 CSCL 08/12

Icing impairs operation of helicopters and other aircraft, antennae, power and communication lines, shipping and superstructures, canal locks, etc. Prevention or easier removal of icing requires reduction of its adhesion strength. Literature study shows that adhesion results from secondary (van der Waals) forces yet exceeds normal cohesive strengths. It depends on free surface energy, low contact angle, good contact and wetting, cleanliness, and texture. Modes of adhesion testing are briefly discussed. Poor adhesion occurs with low energy surfaces or contaminants, e.g. hydrocarbons, fluorocarbons, waxes, oils, etc., particularly when textured or porous. The resulting low contact angle, poor wetting and occlusion of air at the interface weaken the bond or provide stress loci which can initiate cracks and failure. Coefficient of expansion differences may help in release of ice. Further ideas appear among the 100 abstracts presented. A survey of over 300 manufacturers produced over 100 replies. Half of them offered some 100 products deemed worth testing. These are listed with addresses and contacts. Author (GRA)

N79-33333# National Bureau of Standards, Washington, D. C. Polymer Science and Standards Div.
SRM 1470: POLYESTER FILM FOR OXYGEN GAS TRANSMISSION MEASUREMENTS
John D. Barnes and Gordon M. Martin Jun. 1979 47 p refs (PB-297098/6; NBS-SP-260-58; LC-79-600077) Avail: NTIS HC A03/MF A01 CSCL 07D

The gas transmission rates of SRM films with respect to oxygen gas were carefully analyzed using electronic manometric permeation facility. The temperature dependence of the permeability was determined over the temperature range 288 K to 310 K. The statistical measures derived from the data are discussed in detail. It is concluded that the largest source of variability is from one sample to another with a coefficient of variation amounting to four percent. A brief discussion of units for expressing permeabilities is given. Effects due to thermal conditioning and outgassing are discussed. GRA

N79-33334# Massachusetts Inst. of Tech., Cambridge. Center for Policy Alternatives.
PERFORMANCE EVALUATION OF MIT-INDUSTRY POLYMER PROCESSING PROGRAM
Richard M. Kutta and Robert T. Lund 30 Aug. 1978 198 p refs
(Grant NSF CG-0006)
(PB-296539/0; CPA-78-18; NSF/RA-780449) Avail: NTIS HC A09/MF A01 CSCL 05A

The current status of the program is evaluated with regard to financial viability, product commercialization, objectives and incentives and technology transfer. Recommendations are offered for future consideration by the Industrial Advisory Council of the PPP and by those interested in the development of other industrial-academic research collaboratives. GRA

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N79-33335*# Pennsylvania State Univ., University Park.
EVALUATION OF A LOCALLY HOMOGENEOUS MODEL OF SPRAY EVAPORATION Final Report
A. J. Shearer and G. M. Faeth Washington NASA Oct. 1979 113 p refs
(Grant NGR-39-009-077)
(NASA-CR-3198) Avail: NTIS HC A06/MF A01 CSCL 20D

A model of spray evaporation which employs a second-order turbulence model in conjunction with the locally homogeneous flow approximation, which implies infinitely fast interphase transport rates is presented. Measurements to test the model were completed for single phase constant and variable density jets, as well as an evaporating spray in stagnant air. Profiles of mean velocity, composition, temperature and drop size distribution as well as velocity fluctuations and Reynolds stress, were measured within the spray. Predictions were in agreement with measurements in single phase flows and also with many characteristics of the spray, e.g. flow width, radial profiles of mean and turbulent quantities, and the axial rate of decay of mean velocity and mixture fraction. A.W.H.

N79-33336*# National Aeronautics and Space Administration. Lewis Researvh Center, Cleveland, Ohio.
JET FUEL THERMAL STABILITY
William F. Taylor, ed. (Exxon Research and Engineering Co., Linden, N. J.) 1979 158 p Workshop held at Cleveland, 1-2 Nov. 1978
(NASA-TM-79231) Avail: NTIS HC A08/MF A01 CSCL 21D

Various aspects of the thermal stability problem associated with the use of broadened-specification and nonpetroleum-derived turbine fuels are addressed. The state of the art is reviewed and the status of the research being conducted at various laboratories is presented. Discussions among representatives from universities, refineries, engine and airframe manufacturers, airlines, the Government, and others are presented along with conclusions and both broad and specific recommendations for future stability research and development. It is concluded that significant additional effort is required to cope with the fuel stability problems which will be associated with the potentially poorer quality fuels of the future such as broadened specification petroleum fuels or fuels produced from synthetic sources. A.R.H.

N79-33337# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
PHYSICAL AND CHEMICAL PROPERTIES OF JP-4 FUEL FOR 1978 Final Technical Report, Jan. - Dec. 1978
Blaine A. Heitkamp Apr. 1979 93 p
(AF Proj. 3048)
(AD-A070525; AFAPL-TR-79-2040) Avail: NTIS HC A05/MF A01 CSCL 21/4

Random samples of 651 fuel inspection reports on JP-4 fuel have been analyzed for the calendar year 1978. Determination of average properties and frequency distribution of these properties has been undertaken. Properties selected were twenty-three different parameters which coincide with JP-4 fuel specifications (MIL-T-5624K). Through comparison of previous reports, specifically 1975, it can be noted that no major fluctuations have occurred. In compiling the data, all reports were given equal weight regardless of what quantity of fuel was represented. Also, this year th only method used for testing fuel thermal stability was the JFTOT (ASTM Method D 3241) Fuel Coker. GRA

N79-33338# Monsanto Research Corp., Dayton, Ohio.
ANALYSIS OF AIRCRAFT FUELS AND RELATED MATERIALS Final Report, 1 Feb. 1976 - 1 Jun. 1978
F. N. Hodgson and J. D. Tobias Wright-Patterson AFB, Ohio AFAPL Mar. 1979 289 p refs
(Contract F33615-76-C-2014; AF Proj. 3048)
(AD-A070739; MRC-DA-865; AFAPL-TR-79-2016) Avail: NTIS HC A13/MF A01 CSCL 21/4

The physical properties of a series of JP-9 fuels, whose compositions covered the entire range allowed by the fuel specification, were determined. Included in the study are density, viscosity, surface tension, vapor pressure, specific heat, thermal conductivity, dielectric constant, air/nitrogen/water solubility, heat of combustion and freeze point. A proposed gas chromatographic method for the analysis of JP-9 fuel has been validated and results are reported. A survey of methods for hydrocarbon type analysis in fuels was conducted. Specific NMR approaches to this kind of analysis were applied to jet fuels and are presented. Analytical data are reported to determine the effect on combustion of modifying various fuels. A number of special studies which were conducted to aid in the solution of Air Force operational problems were conducted and are reported. GRA

N79-33339# Monsanto Research Corp., Dayton, Ohio.
ANALYSIS OF THE EMISSIONS FROM STORAGE TANKS DURING JP-4 FUEL TRANSFER OPERATIONS. PHASE 3: COLD WEATHER CONDITIONS Final Report
W. R. Feairheller 14 Jun. 1979 53 p
(Contract F41608-78-C-1240)
(AD-A070818) Avail: NTIS HC A04/MF A01 CSCL 21/4

The objective of this program was to determine the amount of JP-4 vapor emitted to the atmosphere during fuel transfer operations. Emissions from 50,000 gallon underground operating tanks were measured and analyzed by a total hydrocarbon analyzer containing a flame ionization detector. GRA

N79-33340# Institute of Gas Technology, Chicago, Ill.
DEVELOPMENT OF COMBUSTION DATA TO UTILIZE LOW-Btu GASES AS INDUSTRIAL PROCESS FUELS. FLAT-FLAME BURNER
Richard T. Waibel and Edward S. Fleming Dec. 1978 30 p refs
(Contract EX-76-C-01-2489; Proj. 61004)
(FE-2489-36; Special-Rept-5) Avail: NTIS HC A03/MF A01

Eight types of industrial burners were tested using three different low- and medium-Btu gases. The performance of each burner with these gases was compared to its performance with natural gas in terms of flame stability and shape, furnace efficiency, heat absorption profile, noise level, temperature profiles, radiant heat flux, post-flame emissivity, and flow direction. DOE

N79-33341# National Technical Information Service, Springfield, Va.
ALCOHOL FUELS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jun. 1979
Diane M. Cavagnaro Jul. 1979 247 p Supersedes NTIS/PS-78/0674 and NTIS/PS-77/0621
(NTIS/PS-79/0714/0; NTIS/PS-78/0674; NTIS/PS-77/0621) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D

Reports from a worldwide literature survey discuss new technology in the field of alcohol fuels. The different blends, synthesis, processes used, properties, engine performance evaluations, economics, safety measures, pollution effects, and combustion studies are covered. Sources from which alcohol fuels can be obtained, such as coal, solid wastes, industrial by-products, and agricultural wastes are reported. Two hundred and forty one abstracts, 50 of which are new entries to the previous edition are presented. GRA

N79-33342# National Technical Information Service, Springfield, Va.
ALCOHOL FUELS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1978 - Jun. 1979
Diane M. Cavagnaro Jul. 1979 144 p Supersedes NTIS/PS-78/0673 and NTIS/PS-77/0620
(NTIS/PS-79/0713/2; NTIS/PS-78/0673; NTIS/PS-77/0620) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D

Federally-funded research on alcohol based fuels that may be used in the future as a fuel source is presented. Synthesis, chemical analysis, performance testing, processing, pollution, economics, environmental effects, and feasibility are included. One hundred and thirty five abstracts, 109 of which are new entries to the previous edition are reported. GRA

N79-33343# National Technical Information Service, Springfield, Va.
ALCOHOL FUELS, VOLUME 1. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1977
Diane M. Cavagnaro Jul. 1979 170 p
(NTIS/PS-79/0712/4) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D

Reports from Federally-funded research are cited covering chemical analysis, performance testing, synthesis, processing, pollution, economics, environmental effect, and feasibility. (This updated bibliography contains 161 abstracts, none of which is new to the previous edition.) GRA

N79-33344# Gulf Research and Development Co., Chestwick, Pa.
INVESTIGATION OF MECHANISM OF REACTIONS INVOLVING OXYGEN-CONTAINING COMPOUNDS IN COAL HYDROGENATION Final Report, Mar. 1979
D. C. Cronauer and R. G. Ruberto Mar. 1979 245 p refs Prepared for EPRI
(EPRI Proj. 713-1)
(EPRI-AF-913) Avail: NTIS HC A11/MF A01

Reactions involving oxygen during hydrogenative liquefaction are presented as well as the establishment of a kinetic model to describe coal liquefaction. Emphasis was directed toward the liquefaction of Belle Ayr subbituminous coal with subsequent test runs made with Burning Star bituminous coal. The liquefaction experiments were made in a CFSTR bench-scale unit operated at temperatures between 400 and 470 C, space times between 5 and 60 minutes and a fixed total pressure of 2000 psig. It was shown that betwen 70% and 85% of the coal organic oxygen is removed as carbon oxides and water. Carboxylic, carbonylic, and etheric functionalities of coal are essentially removed during the liquefaction reaction. The most abundant oxygen-containing group in the reaction product is hydroxylic, a portion of which is necessarily formed by a reduction of other groups. The results of liquefying Belle Ayr coal were correlated by a kinetic model. DOE

N79-33345# General Accounting Office, Washington, D. C. Energy and Minerals Div.
THE POTENTIAL FOR HYDROGEN AS AN ENERGY SOURCE
20 Apr. 1979 16 p
(PB-295317/2; EMD-79-58) Avail: NTIS HC A02/MF A01 CSCL 21D

GAO surveyed a portion of the literature on the status, progress, and problems surrounding the development and commercialization of hydrogen as an energy source. GRA

N79-33346# Columbia Univ., New York. Dept. of Chemical Engineering and Applied Chemistry.
ETHANOLIC FUELS FROM RENEWABLE RESOURCES IN THE SOLAR AGE
Harry P. Gregor and Thomas W. Jeffries 1979 34 p refs
(PB-295645/6) Avail: NTIS HC A03/MF A01 CSCL 21D

Production of ethanol, other liquid fuels, and organic chemicals from cellulosic biomass at prices that can compete with those of petroleum derived materials by employing presently available or soon to be developed membrane technologies is described. Contemporary membrane technologies can already effect major savings in process costs for the conventional fermentation of grains or molasses to produce ethanol; developing membrane technologies could employ cheap cellulosic substrates for ethanol production. GRA

N79-33347# National Technical Information Service, Springfield, Va.
HYDROGEN USE AS A FUEL. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jun. 1979
Audrey S. Hundemann Aug. 1979 191 p Supersedes NTIS/PS-78/0635; NTIS/PS-77/0522; NTIS/PS-76/0458

(NTIS/PS-79/0779/3; NTIS/PS-78/0635; NTIS/PS-77/0522; NTIS/PS-76/0458) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D

Federally-funded research studies pertaining to the technical feasibility of using hydrogen as a fuel for vehicular transportation, electric power generation, and both subsonic and supersonic aircraft are discussed. One hundred and eighty six abstracts, 24 of which are new entries to the previous edition are reported. GRA

N79-33348# Michigan Univ., Ann Arbor. Dept. of Chemical Engineering.
PHYSICAL PROPERTIES AND STABILITY OF WATER IN FUEL OIL EMULSIONS Final Report, Aug. 1977 - Aug. 1978
H. S. Fogler, S. R. Reddy, M. L. Storbeck, J. B. Cross, and S. C. Siegmund Mar. 1979 121 p refs
(Contract DOT-OS-70056)
(PB-296146/4; UMICH-015657; DOT/RSPD/DPB/50-78/17) Avail: NTIS HC A06/MF A01 CSCL 07D

The physical properties of water-in-fuel oil emulsions were investigated. Ultrasonically induced cavitation was used to produce emulsions in gasoline, No. 2 diesel oil, No. 4 heating oil, and No. 6 fuel oil without the use of surfactants. Density and viscosity measurements for each of the four fuels used are presented for various temperatures in the range from 20C to 90C. Interfacial tension measurements, against water for each of the four fuels used are presented for temperatures in the range from 30C to 79C. The stability of water-in-fuel oil emulsions was also studied. A scanning electron microscope and a spectrophotometer were used to study the aging of oil-in-water emulsions, while water-in-oil emulsions were studied using a creaming cell. GRA

N79-33349# General Accounting Office, Washington, D. C. Energy and Minerals Div.
THE UNITED STATES REFINING POLICY IN A CHANGING WORLD OIL ENVIRONMENT Report to the Congress
29 Jun. 1979 35 p refs
(PB-297136/4; EMD-79-59) Avail: NTIS HC A03/MF A01 CSCL 21D

The implications of international and domestic factors affecting the United States refining industry are addressed. This report considers such matters as the control of domestic crude price under The Entitlement Program, the small refinery bias, the availability of domestic and imported crude supplies, environmental and other regulations, and other factors affecting refinery capacity issues. Producer-nation control of crude supplies, foreign refining capacity and supplier-nation downstream developments are also addressed. GRA

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N79-33350 Ohio State Univ., Columbus.
TURBULENT He THERMAL COUNTERFLOW: FLUCTUATIONS AND THE THERMAL RESISTANCE IN LARGE CHANNELS Ph.D. Thesis
Chester Piotrowski 1979 144 p
Avail: Univ. Microfilms Order No. 7922540

Experiments were performed to study the behavior of He II undergoing turbulent thermal counterflow in large (approximately) 1 mm characteristic dimension) flow channels. In one series of experiments small random motions of a flat plate oscillator which was resonantly mounted in the flow channel were observed. The mean squared oscillator displacement, was measured as a function of counterflow velocity and its dependence on temperature, oscillator size, and channel geometry was investigated. In a related experiment the thermal resistance of turbulent He II in 1 mm diameter flow tubes was measured as a function of the counterflow velocity. The results obtained suggest that the general features of the turbulent state described by the Vinen model are common to counterflow in large and small channels. However, the detailed properties of the turbulence are shown to depend strongly on channel size. Dissert. Abstr.

N79-33351# Naval Civil Engineering Lab., Port Hueneme, Calif.
LONG-TERM, DEEP-OCEAN TEST OF CONCRETE SPHERICAL STRUCTURES, RESULTS AFTER SIX YEARS Final Report, Jul. 1971 - Mar. 1978
Harvey H. Haynes and Roy S. Highberg Jan. 1979 53 p refs
(AD-A070864; CEL-TR-869) Avail: NTIS HC A04/MF A01 CSCL 13/13

In 1971, a long-term, deep-ocean test was started on eighteen concrete spheres, 66 inches (1, 676 mm) in outside diameter by 4,12 inches (105 mm) in wall thickness. The spheres were placed in the ocean at depths from 1,840 to 5,075 feet (560 to 1,547 m). Over a 6.4-year period, yearly inspections of the spheres by submersibles have provided data on time-depedent failure and permeability. After 5.3 years, three of the spheres were retrieved from the ocean for laboratory testing. Data on concrete compressive strength gain, short-term implosion strength of the three retrieved spheres, and permeability and durability of the concrete were obtained. This report summarizes the findings from the laboratory and ocean tests. GRA

N79-33352# Stearns-Roger Corp., Denver, Colo.
ECONOMIC EVALUATION OF FABRIC FILTRATION VERSUS ELECTROSTATIC PRECIPITATION FOR ULTRA-HIGH PARTICULATE COLLECTION EFFICIENCY Final Report
S. D. Severson, F. A. Horney, D. S. Ensor (Meteorology Res., Inc.), and G. R. Markowski (Meteorology Res., Inc.) Jun. 1978 137 p refs Sponsored by Elec. Power Res. Inst.
(EPRI Proj. 834-1)
(EPRI-FP-775) Avail: NTIS HC A07/MF A01

The economic selection in each case described was dependent on the particulate emission limit to be met, the physical and chemical characteristics of the coal and fly ash, and the bag replacement schedule of the fabric filter. For systems designed to meet the Federal particulate emission limitation of 0.1 lb/10 to the 6th power BTU, the electrostatic precipitator had a clear advantage in one of the four cases. For systems designed to meet the more stringent New Mexico regulations, the fabric filter had a significant economic advantage in three of the four cases. If designs are based on obtaining a clear stack plume, the fabric filter has a significant advantage. Precipitator costs increase significantly as collection efficiency requirements are increased. Baghouse costs, on the other hand, remain essentially constant due to their inherently high collection efficiency. Baghouses become the economic choice for all coals, even low-resistivity eastern ones, when permissible emission levels drop much below the current NSPS of 0.1 lb/10 to the 6th power BTU. DOE

N79-33353# Maryland Univ., College Park. Dept. of Civil Engineering.
DETERMINATION OF REMAINING FLEXIBLE PAVEMENT LIFE. VOLUME 1: EXECUTIVE SUMMARY Final Report
Matthew W. Witczak Oct. 1978 146 p Sponsored by FHWA and Md. State Highway Admin. 4 Vol.
(PB-296562/2; FHWA/MD/R-79/1-Vol-1) Avail: NTIS HC A07/MF A01; also available in-set of 4 reports HC E16, PB-29656-1-SET CSCL 13B

The development of a methodology for predicting the amount of useful life remaining in flexible pavements exposed to the effects of traffic, age and environment is presented. Such a methodology is considered necessary if accurate predictive models are to be developed for use in future rehabilitation studies of the state highway network. While the use of field cores and direct fatigue testing to estimate remaining life has potential, more fundamental research must be accomplished. Theoretically predicted pavement deflections are greater than measured Road Rater deflections by a factor of 2 to 4. It was felt that the granular base moduli measured in the laboratory is not the true indicator of the in-situ material moduli. Field adjustment factors were developed to account for this difference. Author

N79-33354# Maryland Univ., College Park. Dept. of Civil Engineering.
DETERMINATION OF REMAINING FLEXIBLE PAVEMENT LIFE. VOLUME 2: FLEXIBLE PAVEMENT REMAINING LIFE CHARACTERISTICS INTERPRETED FROM THEORY AND LABORATORY FATIGUE TEST Final Report

Matthew W. Witczak and Edward H. Dalton Oct. 1978 210 p refs Sponsored by FHWA and Md. State Highway Admin. 4 Vol.
(PB-296563/0; FHWA/MD/R-79/2-Vol-2) Avail: NTIS HC A12/MF A01; also available in set of 4 reports HC E17 as PB-296561-SET CSCL 13B

Three Maryland state highways were analyzed. Eighteen inch diameter cores were obtained from which fatigue beams were tested. In conjunction with the lab study, a theoretical highway remaining damage model was developed to assist in correlations between predicted and observed remaining life. The model considers the lateral wander effect of the vehicle as well as the variable tensile strain pattern in a radial direction due to a 9 kip dual wheel load. The general feasibility of using field specimens of asphaltic concrete, tested in the lab for fatigue resistance, to measure the remaining life of a pavement was assessed. It was found that the use of fatigue tests from in-situ field specimens to determine remaining damage analysis has potential but questionable merit. GRA

N79-33355# Maryland Univ., College Park. Dept. of Civil Engineering.
DETERMINATION OF REMAINING FLEXIBLE PAVEMENT LIFE. VOLUME 3: PREDICTED FLEXIBLE PAVEMENT REMAINING LIFE INTERPRETED FROM VARIOUS ANALYTICAL PROCEDURES Final Report
Matthew W. Witczak Oct. 1978 426 p refs Sponsored by FHWA and Md. State Highway Admin. 4 Vol.
(PB-296564/8; FHWA/MD/R-79/3-Vol-3) Avail: NTIS HC A19/MF A01; also available in set of 4 reports HC E17, PB-296565-SET CSCL 13B

Measured laboratory properties were used in a theoretical multilayered analysis to predict fatigue cracking repetitions from cumulative damage theory by the Pell and Brown, Monismith, Kentucky Highway, the Asphalt Institute and Shell Oil fatigue relationships. Remaining damage predictions for each pavement were also made using the AASHTO design method in both a 'conventional' and 'limiting layer' analysis as recommended by NCHRP 128. It was concluded that the best agreement between measured cracking distress and predicted fatigue life occurred with the Monismith criteria. GRA

N79-33356# Maryland Univ., College Park. Dept. of Civil Engineering.
DETERMINATION OF REMAINING FLEXIBLE PAVEMENT LIFE. VOLUME 4: ANALYSIS OF IN-SITU GRANULAR LAYER MODULUS FROM DYNAMIC ROAD RATER DEFLECTIONS Final Report
Matthew W. Witczak and Paul A. D'Amato Oct. 1978 265 p refs Sponsored by FHWA and Md. State Highway Admin. 4 Vol.
(PB-296565/5; FHWA/MD/R-79/4-Vol-4) Avail: NTIS HC A12/MF A01; also available in set of 4 reports HC E17, PB-296561-SET CSCL 13B

The ability of elastic layered theory coupled with nonlinear dynamic modulus tests to predict comparable pavement deflections to that measured from dynamic road rater deflections was investigated. It was found, for over 180 test dates, pavement sections, sensor combinations, that the theoretically predicted deflection over-estimated the measured road rater deflections by a factor of about 2 to 4 (2.8 average). It was concluded that the current laboratory method of modulus characterization to incorporate nonlinear behavior underestimates the modulus of that granular material. These results indicated that relationships between surface deflection, shear strain, and granular layer modulus can be applied to predict in-situ modulus from deflection measurements. GRA

N79-33357# Texas Transportation Inst., College Station.
EXTENSION AND REPLACEMENT OF ASPHALT CEMENT WITH SULFUR, EXECUTIVE SUMMARY Final Report, Jun. 1975 - Jun. 1978
D. E. Pickett, D. Saylak, R. L. Lytton, W. E. Conger, and D. Newcomb Oct. 1978 11 p
(Contract DOT-FH-11-8799)
(PB-296307/2; FHWA/RD-78/160) Avail: NTIS HC A02/MF A01 CSCL 13C

The use of elemental sulfur as a partial replacement and/or extender or asphalt cement in highway paving mixtures is investigate. The physical properties of combinations of sulfur-asphalt emulsions are discussed. Characterization tests on selected combinations of agregate, asphalt, and sulfur using three different mixing methods are presented. The use of computer programs for screening design combinations and evaluating performance of selected pavements is described. GRA

N79-33358# National Bureau of Standards, Washington, D. C.
REPORT OF THE NATIONAL CONFERENCE ON WEIGHTS AND MEASURES, 63D
Harold F. Wollin, ed., Louis E. Barbrow, ed., and Ann P. Heffernan, ed. Feb. 1979 326 p Conf. held at Washington, D. C., 9-14 Jul.
(PB-296236/3; NBS-SP-532; LC-26-27766) Avail: NTIS HC A15/MF A01 CSCL 14B

Issues discussed include: (1) metric conversion in the United States; (2) problems relating to the quantity fill, labeling, and inspection of packaged commodities; (3) requirements covering the design and performance of new weighing and measuring technology; (4) and recommendations for improvement in weights and measures administration. GRA

N79-33359# National Bureau of Standards, Washington, D. C.
REPORT TO AID ON AN NBS/AID WORKSHOP ON STANDARDIZATION AND MEASUREMENT SERVICES
H. Steffen Peiser May 1979 157 p refs
(Grant PASA-TA(CE)-6-71)
(PB-296326/2; NBSIR-78-1712) Avail: NTIS HC A08/MF A01 CSCL 14B

The workshop presented gave standards officials of industrializing nations insight into the standards and measurement systems of the United States and the role of the National Bureau of Standards, so that these officials might consider what parts of the U.S. system might usefully be adapted to conditions in their home countries. An exchange of standardization experience in each of the participant's countries was presented by delivered papers which are reproduced here. Countries represented included Argentina, Bangladesh, Bolivia, Egypt, Ghana, Indonesia, Iran, Kenya, Korea, Phillipines, and Thailand. In addition, there were representatives from the Arab Organization for Standardization and Metrology and the International Organization for Standardization. GRA

N79-33360# National Bureau of Standards, Washington, D. C. Office of Measurement Services.
CATALOG OF FEDERAL METROLOGY AND CALIBRATION CAPABILITIES, 1979 EDITION
Kathryn O. Leedy Jun. 1979 57 p
(PB-297151/3; NBS/SP-546; LC-79-600075) Avail: NTIS HC A04/MF A01 CSCL 14B

Federal laboratories involved in metrology and calibration are listed. The name of a person at each laboratory to contact for more information is included as well as the laboratory telephone number and address. The capabilities of each laboratory are indicated in a tabular listing by agency. To provide geographical distribution, the laboratories are listed by States. In addition, the laboratories are shown on a map by coded number. Other references are described. GRA

N79-33361# Portland Cement Association, Skokie, Ill.
THE INFLUENCE OF ENVIRONMENT AND MATERIALS ON D-CRACKING Final Report
Paul Klieger, David Stark, and Wilmer Teske Oct. 1978 111 p Sponsored by FHWA and Ohio Dept. of Transportation
(PB-296145/6; FHWA/OH-78/06) Avail: NTIS HC A06/MF A01 CSCL 13B

A three-phase program was undertaken to determine the effectiveness of reduced aggregate particle sizes in minimizing D-cracking in field exposures, to determine the importance of source of fine agregate and quantity of source of fine aggregate and quantity of maximum permissible aggregate particle size on freeze-thaw durability, and to evaluate the relative importance of certain field environmental conditions on D-cracking. Field surveys thus far indicate that reducing maximum aggregate particle sizes is beneficial, while the laboratory tests indicate that the proportion of coarser particle sizes has a significant effect on durability. It was shown that source of fine aggregate has

essentially no bearing on durability, even when derived from coarse aggregate material of known low durability. GRA

N79-33362# Purdue Univ., Lafayette, Ind.
APPLICATION AND FIELD EVALUATION OF VERY THIN SKID RESISTANT PAVEMENT SURFACES Interim Report
Ryan R. Forrestel 2 Aug. 1978 80 p refs Sponsored by DOT and Indiana State Highway Commission
(PB-296138/1; JHRP-78-12; FHWA/IN-78/12) Avail: NTIS HC A05/MF A01 CSCL 13B

Skid resistance on worn, structurally sound, portland cement concrete pavements was investigated through the evaluation of predetermined mixes and application techniques in the field through the application of very thin, concrete overlays. The overlays 3/8 inch or less in depth, were applied by two distinct application techniques, brooming and screeding. The four predetermined mixes were applied in twelve overlays. The field work installation of the overlays is covered. GRA

N79-33363# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
DESIGN AND CONSTRUCTION OF COMPACTED SHALE EMBANKMENTS. VOLUME 5: TECHNICAL GUIDELINES Final Report
W. E. Strohm, Jr., G. H. Bragg, Jr., and T. W. Ziegler Dec. 1978 218 p refs Sponsored by FHWA
(FHWA Order 4-1-0196)
(PB-296506/9; FHWA/RD-78/141) Avail: NTIS HC A10/MF A01 CSCL 13B

Geological investigations, durability classification of shales, design features, and construction procedures unique to compacted shale embankments for highways are presented. Techniques for evaluating existing shale embankments and remedial treatment methods for distressed shale embankments are reported. Index tests and classification criteria for determining shale durability, techniques for evaluating excavation characteristics, and alternative procedures for excavation, placement and compaction of shales to achieve adequate stability and minimum settlement are described. The use of drainage measures, selective excavation and placement of nondurable shales in thin lifts with procedural compaction provisions based on field test pads is emphasized. GRA

N79-33364# Mississippi Univ., University. Dept. of Civil Engineering.
CRITERIA FOR EMULSIFIED ASPHALT STABILIZATION OF SANDY SOILS Final Report, Sep. 1974 - Aug. 1978
K. P. George Dec. 1978 111 p refs Sponsored by DOT and Mississippi State Highway Dept.
(PB-296546/5; FHWA/MS-79/062-F) Avail: NTIS HC A06/MF A01 CSCL 13C

Various factors affecting stabilization of sands with emulsion are summarized. Using the test results in five naturally occuring soils and one synthetic aggregate, mix design criteria for sands and sandy soils are proposed and a step-by-step procedure for mix design of cement-modified emulsion treated material (CETM) is presented. The base layer of a three-mile section of a secondary road was constructed with CETM in order to verify and substantiate the proposed design criteria and to gain insight into the construction control specifications. In spite of the inclement weather during the construction period, the CETM mixture was a satisfactory material for base construction. GRA

N79-33365# Wisconsin Univ. - Madison. Coll. of Engineering.
CRYOGENIC RECYCLING OF SOLID WASTE
Norman R. Braton 1978 26 p refs Sponsored in part by Agency for International Development
(PB-296385/8) Avail: NTIS HC A03/MF A01 CSCL 13B

Liquid nitrogen cryogenic processing of various materials is introduced. Fracture toughness of materials is discussed in relation to cryogenic processing, and some specific applications of cryogenic recycling are mentioned. A mobile prototype unit for cryogenic processing of a variety of materials including tires and cables is described. GRA

N79-33366# National Bureau of Standards, Washington, D. C. Center for Mechanical Engineering and Process Technology.
RECENT IMPROVEMENTS TO THE ASTM-TYPE ULTRASONIC REFERENCE BLOCK SYSTEM Final Report
Daniel J. Chwirut Apr. 1979 54 p refs Sponsored in part by AMMRC and NASA
(Contract F33615-76-F-6751)
(PB-296044/1; NBSIR-79-1742) Avail: NTIS HC A04/MF A01 CSCL 14B

On the aluminum block system (ASTM E 127 and NBS TN924), efforts were focused on better definition of the measurement equipment (transducer and instrument), the implementation of a Measurement Assurance Program and Loaner Block Service, and modeling of the distance-amplitude relationship. It is shown that a large increase in the precision of reference block readings is easily achievable by implementing simple changes and controls in the measurement procedure. On steel and titanium blocks (e.g. ASTM E-428), efforts were directed toward quantifying the extent of reproducibility possible among blocks fabricated by both conventional drilling and by diffusion bonding. Reasonable reproducibility is achieved by both, with the diffusion-bonding process offering both advantages and disadvantages. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N79-33367 Dayton Univ., Ohio.
DEVELOPMENT OF A RADAR SIMULATOR Ph.D. Thesis
David James Krile 1979 169 p
Avail: Univ. Microfilms Order No. 7918828

The specifications for a small, light weight, inexpensive radar simulator were formulated. The simulator was then designed and constructed. It is a short range radar which transmits ultrasonic waves, receives, processes, and displays the echoes. Variable parameters in the simulator include signal gain, noise gain, pulse width, pulse rate, bandwidth, type of detection, and integration. Complete schematic diagrams and circuit descriptions of the radar simulator are given. Dissert. Abstr.

N79-33368 Oregon Graduate Center, Beaverton.
SPATIAL DIVERSITY FOR ATMOSPHERIC OPTICAL COMMUNICATIONS Ph.D. Thesis
James Harwood Churnside 1978 201 p
Avail: Univ. Microfilms Order No. 7923524

Spatial diversity was investigated as a means for partially overcoming the deleterious effects of the clear air turbulent atmosphere on direct detection and heterodyne optical communication systems. For photon counting receivers, an averaged threshold receiver is presented, which is seen to be simpler to implement and to provide consistently lower bit error rates than optimized memoryless receivers. The heterodyne results include the introduction of a partial tracking heterodyne array; a discussion, both theoretical and experimental, of IF signal magnitude probability distributions for static heterodyne arrays; and a theoretical treatment of the probability distribution for a single heterodyne element with angle-of-arrival tracking. Dissert. Abstr.

N79-33369 Ohio State Univ., Columbus.
SUBSURFACE ELECTROMAGNETIC TARGET CHARACTERIZATION AND IDENTIFICATION Ph.D. Thesis
Luen Charm Chan 1979 276 p
Avail: Univ. Microfilms Order No. 7922465

A method for subsurface radar target characterization and identification is described. This method characterizes subsurface radar targets by their complex natural resonances which are extracted directly from their backscattered time domain waveforms. The difference equation coefficients associated with the complex resonances are then used in the predictor correlator for target identification. The characterization and identification processes are discussed. A first generation microcomputer identification radar system is implemented for target identification

in real time and the practical identification performance is presented. Dissert. Abstr.

N79-33370 Georgia Inst. of Tech., Atlanta.
ADAPTIVE TRANSMISSION WITH NONDISPERSIVE NAKAGAMI-m CHANNELS Ph.D. Thesis
Thomas Elmo Brewer 1979 144 p
Avail: Univ. Microfilms Order No. 7922097

The use of a feedback channel to improve the transmission of digital data over a fading channel is investigated. A pilot tone is transmitted at the transmitter and the channel gain is investigated at the receiver. The value of the channel gain is then sent over the feedback channel to the transmitter and transmission parameters such as the data rate and transmitter power are altered to reduce transmission errors subject to constraints on the average transmitter power and system data rate. The Nakagami-m probability density function is used to model the channel gain. The modulation scheme is noncoherent binary frequency shift keyed. The data is transmitted bit-by-bit and not encoded. There is only one data channel. The receiver consists of matched filters and envelope detectors.
Dissert. Abstr.

N79-33371 Colorado Univ. at Boulder.
TRANSIENT ELECTROMAGNETIC PROPAGATION OVER CONDUCTING EARTH Ph.D. Thesis
Hussain Ali Haddad 1979 252 p
Avail: Univ. Microfilms Order No. 7923244

Transient response for the fields of an elementary dipole in the presence of a finitely conducting earth is evaluated in terms of the singularities of the time-harmonic fields in the complex frequency domain. The transient field is found to consist of two kinds of waves; one of the these arrives early via propagation in air and the other arrives later via propagation in the earth medium. The time-harmonic solution of an arbitrarily oriented dipole above a two-layer lossy medium is obtained to a high degree of accuracy using a combination of numerical and analytical computational schemes. Marked differences exist between the field structures of a vertical dipole and a horizontal dipole in the case when the observation is made on the earth in the plane of the dopole. The magnitude of the power flux in the near field region is shown to have maxima and minima depending upon the thickness and the electric constants of the slab.
Dissert. Abstr.

N79-33372 California Univ., Los Angeles.
NEW APPROACHES TO SAMPLED-DATA ANALOG SIGNAL PROCESSING Ph.D. Thesis
Massood Jahanbegloo 1979 163 p
Avail: Univ. Microfilms Order No. 7921420

Techniques in sampled data signal processing are examined, and approaches toward the design of switched capacitor filters and periodic time varying charge transfer devices (CTD's) is presented. The design of switched capacitor (SC) filters are discussed. A class of lossless s-to-z transformations are introduced and SC integrators to realize such transformations are presented. A general synthesis technique is described for obtaining a switched capacitor filter from an active RC prototype. The response of the SC filter is related to that of the prototype by the bilinear z-transform. The possibility of time sharing of the operational amplifiers among several leapfrog filters is investigated. A design technique for finding switched capacitor equivalents of floating inductors and LC-resonators is evaluated. The resulting circuit needs only one operational amplifier with grounded input and output ports. Dissert. Abstr.

N79-33373*# Hughes Aircraft Co., Los Angeles, Calif. Space and Communications Group.
THE 18 AND 30 GHz FIXED SERVICE COMMUNICATION SATELLITE SYSTEM STUDY: EXECUTIVE SUMMARY Final Report
Leonard M. Bronstein Sep. 1979 11 p
(Contract NAS3-21367)
(NASA-CR-159627-1; HAC-REF-E1992-1; SCG-90275R) Avail: NTIS HC A02/MF A01 CSCL 17B

The use of the 18 and 30 GHz bands for fixed service satellite communications is examined. Primary objectives were to determine if satellite communication systems using this allocation (27.5 to 30.0 GHz uplink; 17.7 to 20.2 GHz downlink) can be cost competitive with alternate means of communication, and to determine what technological developments would be required to make these systems competitive. To meet these objectives, the cost and performance to be expected of 18 and 30 GHz hardware in the 1985 to 1990 era was assessed, selected trunking and direct to user concepts were optimized, and the cost of these systems was estimated. Finally, the technology developments required to make the most promising of the concepts competitive were identified. M.M.M.

N79-33374*# Hughes Aircraft Co., Los Angeles, Calif. Space and Communications Group.
THE 18 AND 30 GHz FIXED SERVICE COMMUNICATIONS SATELLITE SYSTEM STUDY Final Report
Leonard M. Bronstein Sep. 1979 297 p refs
(Contract NAS3-21367)
(NASA-CR-159627-2; HAC-Ref-E1992-2; SCG-90272R) Avail: NTIS HC A13/MF A01 CSCL 17B

The use of the 18 and 30 GHz bands for fixed service satellite communications is examined. The cost and performance expected of 18 and 30 GHz hardware is assessed, selected trunking and direct to user concepts are optimized, and the cost of these systems are estimated. The effect of rain attenuation on the technical and economic viability of the system and methods circumventing the problem are discussed. Technology developments are investigated and cost estimates of these developments are presented. A.W.H.

N79-33375*# Hersh Acoustical Engineering, Chatsworth, Calif.
EFFECTS OF REFRACTION BY MEANS FLOW VELOCITY GRADIENTS ON THE STANDING WAVE PATTERN IN THREE-DIMENSIONAL, RECTANGULAR WAVEGUIDES
Alan S. Hersh Jun. 1979 48 p refs
(Contract NAS1-15311)
(NASA-CR-159108) Avail: NTIS HC A03/MF A01 CSCL 20N

The influence of a mean vortical flow on the connection between the standing wave pattern in a rectangular three dimensional waveguide and the corresponding duct axial impedance was determined analytically. The solution was derived using a perturbation scheme valid for low mean flow Mach numbers and plane wave sound frequencies. The results show that deviations of the standing wave pattern due to refraction by the mean flow gradients are small. Author

N79-33376# National Aviation Facilities Experimental Center, Atlantic City, N. J.
AN EVALUATION OF CERTAIN SELECTED MODIFICATIONS TO THE NATIONAL AIRSPACE SYSTEM BIMODAL TRACKING ALGORITHM
Robert E. Lefferts Apr. 1979 41 p refs Continuation of work reported in FAA-NA-79-15
(AD-A072084; FAA-NA-79-16; ANA-220; ANA-1) Avail: NTIS HC A03/MF A01 CSCL 17/9

Various modifications of the standard bimodal tracking algorithm were considered, including a comparison of fixed versus dynamic search areas, circular versus noncircular search areas, the introduction of a one-scan delay before use of the large search area smoothing constants, and an evaluation of the influence of the search area design probability on the performance of the tracking algorithm. For a straight-line trajectory, the velocity errors observed using the fixed search area design were approximately three times larger than those theoretically obtainable using an alpha-beta tracking algorithm. The use of a dynamic search area with one-scan delay gave a considerable improvement in the straight-line performance of the tracking algorithm, while at the same time small reductions were observed in the peak transient errors for maneuvering targets. Since the performance of the tracking algorithm is highly dependent on the size of the search area, search area parameters should be site dependent to allow equivalent performance from all radar sites. K.L.

N79-33377# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
COMPARISON BETWEEN A FORECASTING METHOD FOR THE PROPAGATION OF HF AND DATA OBTAINED BY

IONOSONDES [COMPARACAO ENTRE A PREVISAO PARA PROPAGACAO EM HF E DADOS OBTIDOS POR IONOSSONDA]
I. J. Kantor and E. R. dePaula Jul. 1979 19 p refs In PORTUGUESE
(INPE-1521-RPE/057) Avail: NTIS HC A02/MF A01

Data utilized with the purpose of forecasting the HF propagation is compared with the data obtained by ionosondes of INPE. The measurements of the critical frequency of the ionosphere helped in the evaluation of the errors associated with the forecasting method. Transl. by M.M.M.

N79-33378# Communications Research Centre, Ottawa (Ontario).
RADIO NOISE SURVEY PROCEDURES FOR A COMMUNICATION SITE: 0.15 - 30 MHz
W. R. Lauber and C. J. Pike Aug. 1979 51 p refs
(CRC-1325) Avail: NTIS HC A04/MF A01

A step-by-step plan for performing a radio noise survey at a communication site is provided. The data obtained in the survey are used to describe the radio noise environment at the site and may be used to see if a good site is deteriorating or a bad site is improving. The general plan allows for some variation, as each site is different, but is strict enough for compatible results. The measurement data is described as well as ways to analyze and use them in order to evaluate the site. Details for future reassessment are presented. Instructions on the use of basic data for communication system design and system performance prediction are given. M.M.M.

N79-33379*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CARRIER: INTERFERENCE RATIOS FOR FREQUENCY SHARING BETWEEN SATELLITE SYSTEMS TRANSMITTING FREQUENCY MODULATED AND DIGITAL TELEVISION SIGNALS
Scott P. Barnes 1979 8 p refs To be presented at the Natl. Telecommun. Conf., Washington, D. C., 26-28 Nov. 1979; sponsored by IEEE
(NASA-TM-79265; E-180) Avail: NTIS HC A02/MF A01 CSCL 17B

Results are presented of subjective and quantitative tests describing the results of interference to a particular digital television system from a frequency modulated (FM) television system, and for interference to an FM television system from a digital television system. M.M.M.

N79-33380# DeBettencourt (Joseph T.), West Newton, Mass.
LITHOSPHERIC RADIO PROPAGATION ON MODELLING: A FEASIBILITY STUDY Final Report, 1 Sep. 1978 - 28 Feb. 1979
Joseph T. DeBettencourt and Ronald W. P. King Apr. 1979 137 p refs
(Contract N00014-78-C-0668)
(AD-A070531; DBK-2) Avail: NTIS HC A07/MF A01 CSCL 20/14

Radio wave propagation in the earth's crust is reviewed. This has been studied by many investigators who usually assume the crust to be a planar slab of low loss-tangent, bounded on top and bottom by regions of large loss-tangent. Available conceptual depth profiles of complex dielectric constant of the lithospheric waveguide are reviewed and theories extant summarized. Sources were usually VED's inserted through vertical bore-holes. For ocean emplaced antennas located near the ocean-lithosphere boundary, the sources are horizontally polarized and propagation is predominantly by means of lateral waves. Calculations are reported for a wide range of conditions. The useful characteristics of lateral wave transmission are discussed. The measured properties of scaled waveguide propagation that have been reported could not accurately scale the losses in the overburden since it was represented by a metal plate. The principles of electrodynamic similitude are delineated and two different experiments using similitude with different depth profiles are discussed. GRA

N79-33381# Rome Air Development Center, Griffiss AFB, N.Y.
DUAL FREQUENCY MICROSTRIP DISC ANTENNA ELEMENTS
Nicholas Kernweis and John F. McIlvenna Mar. 1979 26 p refs
(AD-A070617; RADC-TR-79-74) Avail: NTIS HC A03/MF A01 CSCL 09/5

Two radial conducting strips, placed on the edge of a microstrip disc antenna, can be used to produce a dual frequency element. The strip length and circumferential location determine the frequency spread. This report describes a series of experiments that catalog the various effects produced by single and double strips in a variety of circumferential locations. GRA

N79-33382# University of Southern California, Los Angeles. Dept. of Electrical Engineering.
RESEARCH IN COMMUNICATION THEORY Final Report, 16 Jun. 1976 - 15 Jun. 1979
R. A. Scholtz and L. R. Welch Jun. 1979 9 p refs
(Grant DAAG29-76-G-0246)
(AD-A071745; ARO-13728.9-EL) Avail: NTIS HC A02/MF A01 CSCL 09/4

The major results of research performed on this grant have been published or are pending publication. This report contains the following abstracts which indicates the breadth and depth of results: The Spread Spectrum Concept; Group Characters; Sequences with Good Correlation Properties; Bent-Function Sequences; A Class of Binary Balanced Sequences; Partial-Period Correlation Properties of PN Sequences; Spectral Shaping Without Subcarriers; Continued Fractions and Berlekamp's Algorithm; The Fast Decoding of Reed-Solomon Codes Using Fermat Theoretic Transforms and Continued Fractions; Recursive Decoders for Convolutional Codes Transmitted Over Burst Channels; and Mutual Decoding and Generalized Code Interleaving in Burst-Error Channels. GRA

N79-33383# Sandia Corp., Livermore, Calif.
ROADRUNNER: A NOVEL RADAR GUIDANCE CONCEPT
James R. Kelsey 1979 7 p refs Presented at the 2d Echelon Armor Interdiction Symp., Chicago, 1 May 1979
(Contract EY-76-C-04-0789)
(SAND-79-0412C; Conf-790536) Avail: NTIS HC A02/MF A01

An exploratory development program aimed at demonstrating a novel radar navigation/guidance scheme which enables a small unmanned aircraft (drone) to follow roads is presented. Since vehicles on the road can be easily detected, this aircraft could be used as either a strike vehicle itself or as a reconnaissance adjunct to another strike system. The guidance scheme involves onboard radar measurements of the backscatter response of the terrain beneath the aircraft. The differences in reflectivity between road and roadside surfaces are processed by a small onboard computer to generate guidance commands to keep the vehicle over the road. Preliminary system definition includes a 17 GHz radar aboard a subsonic, propeller-driven unmanned aircraft. The drone could be either ground or air launched, and would be expendable. Payload capabilities of 50 to 100 kg are envisioned, with an operational range of 50 to 100 km. DOE

N79-33384# California Univ., Livermore. Lawrence Livermore Lab.
XENON SHOCK WAVES DRIVEN BY HIGH MAGNETIC FIELD
J. W. Shearer, J. W. Beasley, A. Reyenga, and D. Steinberg May 1979 25 p refs Presented at 2nd Intern. Conf. on Megasus Magnetic Field Generation and Related Topics, Washington, D. C., 29 May - 1 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82194; Conf-790540-6) Avail: NTIS HC A02/MF A01

It is shown that magnetic fields in the range 0.2 to 2.0 MG produce shocks in 0.1 to 1.0 atmosphere xenon gas which have shock Mach numbers as high as 100. The velocity, compression and luminosity using pulsed X-ray and other diagnostics were studied. In some of the experiments, ultraviolet radiation from the shocked xenon produced luminous precursors and interactions with the metal walls of the shock tube. The addition of an ultraviolet absorbing organic impurity vapor diminished the amplitude of these effects. A clean, chemically inert metal wall is even more effective. Further experiments show that magnetic shear has a stabilizing effect on the current-carrying layer of

the shocked gas. It is concluded that a megagauss magnetic field is a useful shock tube driver for producing high velocity shock waves. DOE

N79-33385# Mitre Corp., McLean, Va. Metrek Div.
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: SYSTEM EVALUATION Final Report
Roger A. Duncan, Carol Paquette, Jacob H. Parness, and A. Barry Strauch Jan. 1979 67 p refs
(Contract NO1-LM-4727)
(PB-295549/0; MTR-79W00032; LHNCBC-79/10) Avail: NTIS HC A04/MF A01 CSCL 06E

The system evaluation is documented with a description of the evaluation process, a review of relevant literature, evaluation findings, and conclusions and recommendations. Appendices present a summary of each CTS application, address technical and behavioral considerations in future satellite-mediated biomedical communication work, and provide details of a method of quantitative evaluation, survey results, and cost calculations. GRA

N79-33386# Mitre Corp., McLean, Va. Metrek Div.
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: SYPOSIUM PROCEEDINGS Final Report
Roger A. Duncan Jan. 1979 72 p Symposium held at Alexandria, Va., 25 - 26 Sep. 1978 Sponsored in part by HEW
(Contract NO1-LM-4727)
(PB-295550; MTR-79W00024) Avail: NTIS HC A04/MF A01 CSCL 06E

The teaching and holding of teleconferences on biomedical subjects using video and audio transmission via the communication technology satellite is examined. Subject matter for the teleconferences included neonatal grand rounds, burn treatment, patient nutritional assessment, holistic health care, and interviews of prospective medical students. A.W.H.

N79-33387# Commerce Dept., Washington, D.C. National Telecommunications and Information Administration.
PROGRAM FOR CONTROL OF ELECTROMAGNETIC POLLUTION OF THE ENVIRONMENT: THE ASSESSMENT OF BIOLOGICAL HAZARDS OF NONIONIZING ELECTROMAGNETIC RADIATION
Mar. 1979 255 p refs
(PB-296907/9; NTIA/Rept-79/19; Rept-5) Avail: NTIS HC A12/MF A01 CSCL 06R

An overview of program progress and funding is presented. Publications and presentations representative of program activity are cited. Relevant legislation, standards (on a worldwide basis) and various nonfederal activities are also included. GRA

N79-33388# National Technical Information Service, Springfield, Va.
SINGLE SIDEBAND COMMUNICATIONS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jun. 1979
William E. Reed Jul. 1979 183 p Supersedes NTIS/PS-78/0734, NTIS/PS-77/0595, and NTIS/PS-76/0548
(NTIS/PS-79/0761/1; NTIS/PS-78/0734; NTIS/PS-77/0595; NTIS/PS-76/0548) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

The bibliography cites reports from worldwide research on single sideband communication equipment and systems. Reports on the design, development, and operation are presented. Studies on single sideband transmission and signals are included. This updated bibliography contains 186 abstracts, 14 of which are new entries to the previous edition. GRA

N79-33389# National Technical Information Service, Springfield, Va.
SINGLE SIDEBAND COMMUNICATIONS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jun. 1979
William E. Reed Jul. 1979 172 p Supersedes NTIS/PS-79/0733; NTIS/PS-77/0594; NTIS/PS-76/0547
(NTIS/PS-79/0760/3; NTIS/PS-78/0733; TIS/PS-77/0594; NTIS/PS-76/0547) Avail: NTIS HC $28.00/MF $28.00 CSCL 17B

Federally-sponsored research on single sideband communication equipment and systems is presented along with reports on the design, development, and operation are presented. Studies on single sideband transmission, modulation, and signal processing. (This updated bibliography contains 163 abstracts, 9 of which are new entries to the previous edition.) GRA

N79-33390# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
A THEORETICAL STUDY OF UNBALANCED EFFECTS ON RECEIVING DIPOLES
M. T. Ma May 1979 16 p refs
(PB-296207/4; NBSIR-79-1605) Avail: NTIS HC A02/MF A01 CSCL 09E

Specific ground effects on the calibration of a dipole antenna with an arbitrary inclination angle with respect to the ground are analyzed by means of a theoretical model. Numerical results representing this undesired effect are also included. GRA

N79-33391# Office of Science and Technology, Washington, D. C.
SUMMARY OF SURVEY ON THE FEDERAL ROLE IN SATELLITE COMMUNICATIONS RESEARCH AND DEVELOPMENT
1 Jul. 1978 32 p
(PB-295949/2) Avail: NTIS HC A03/MF A01 CSCL 17B

Results of an OSTP staff survey on selected private industry firms and Federal agencies on the current state of affairs in satellite communications research and development are presented. Emphasis was given to developments within the U. S. satellite communications industry since the policy decision in 1972 which placed more reliance on the private sector and user consortiums for development of advanced satellite communications technology and services. Information and viewpoints useful for future policy development are given. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N79-33392* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CALIBRATING PRESSURE SWITCH Patent
Norman J. Smith, inventor (to NASA) (Boeing Co., Seattle, Wash.) Issued 16 Apr. 1968 5 p Filed 4 May 1966 Sponsored by NASA
(NASA-Case-XMF-04494-1; US-Patent-3,378,657; US-Patent-Appl-SN-547643; US-Patent-Class-200-83) Avail: US Patent and Trademark Office CSCL 09A

A pressure switch assembly comprising a body portion and a switch mechanism having a contact element operable between opposite limit positions is described. A diaphragm chamber is provided in the body portion which mounts therein a system diaphragm and a calibration diaphragm which are of generally the same configuration and having outer faces conforming to the inner and outer walls of the diaphragm chamber. The space between the inner faces of the diaphragms defines a first chamber section and the space between the outer face of one of the diaphragms and the outer wall of the diaphragm chamber defines a second chamber section. The body portion includes a system pressure port communicating with one of the chamber sections and a calibration pressure port communicating with the other chamber section. An actuator connected to one of the diaphragms and the contact element of the switch operates upon pressure change in the diaphragm sections to move said contact element between limit positions.

Official Gazette of the U.S. Patent and Trademark Office

N79-33393* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FUSED SWITCH Patent
George J. Weber, inventor (to NASA) (McDonnell Aircraft Corp., St. Louis) Issued 3 Mar. 1964 3 p Filed 6 Apr. 1960 Sponsored by NASA
(NASA-Case-XMS-01244-1; US-Patent-3,123,692; US-Patent-Appl-SN-20370; US-Patent-Class-200-114) Avail: US Patent and Trademark Office CSCL 09A

An electric switch device is described which can be used safely even in an explosive environment. The switch has an operating arm, and a moveable actuator which is engaged by the arm and moved between a number of positions in which the arm opens or closes the switch. A fuse is slidably positioned in a passage through the actuator. The fuse can be replaced in the passage by another fuse when the actuator is in one of its many positions. The device is lightweight and compact, is capable of withstanding severe shock, and is not adversely affected by extremes of temperature.
Official Gazette of the U.S. Patent and Trademark Office

N79-33394 Missouri Univ. -Rolla.
ADAPTIVE MULTILEVEL INTEGRATION RECEIVERS FOR IMPULSIVE INTERFERENCE Ph.D. Thesis
YoungYearl Han 1979 175 p
Avail: Univ. Microfilms Order No. 7921533

Noncoherent detectors with multilevel integration in non Gaussian noise are investigated. The non Gaussian noise model employed has as a limiting case Gaussian statistics. The receiver structures for detection of constant and time varying signals in non Gaussian noise are given. Noncoherent detectors with multilevel integration are optimized for the impulsive interference and to the criterion of maximizing the asymptotic efficiency of the receivers. The adaptation of multilevel integration receivers to unknown noise parameters is studied through parameter estimators for the noise density which employs stochastic approximation. Dissert. Abstr.

N79-33395 California Univ., Los Angeles.
NUMERICAL DESIGN OF DATA TRANSMISSION FILTERS Ph.D. Thesis
Shih-Chung Fan 1979 202 p
Avail: Univ. Microfilms Order No. 7921392

A new technique was developed for the design of data transmission filters in the time domain. The circuit used was a cascade of constant resistance loss and delay equalizers and fixed low pass filters. This technique has the advantages of low sensitivity to circuit element value variations and the guaranteed realiability. The circuit configuration is specified by the designer and the element values of the equalizers are optimized. The least-squares method was used in the optimizations. This technique was applied to the design of a cable data transmission system and digital radio systems. Dissert. Abstr.

N79-33396*# Hughes Aircraft Co., Newport Beach, Calif. Solid State Products Div.
DESIGN, PROCESSING AND TESTING OF LSI ARRAYS: HYBRID MICROELECTRONICS TASK Interim Report, 28 Sep. 1978 - 27 Mar. 1979
R. P. Himmel, S. M. Stuhlbarg, R. G. Ravetti, and P. J. Zulueta 15 Apr. 1979 67 p
(Contract NAS8-32607)
(NASA-CR-161312; FR79-92-1007) Avail: NTIS HC A04/MF A01 CSCL 09C

Mathematical cost factors were generated for both hybrid microcircuit and printed wiring board packaging methods. A mathematical cost model was created for analysis of microcircuit fabrication costs. The costing factors were refined and reduced to formulae for computerization. Efficient methods were investigated for low cost packaging of LSI devices as a function of density and reliability. Technical problem areas such as wafer bumping, inner/outer leading bonding, testing on tape, and tape processing, were investigated. R.E.S.

N79-33397# National Bureau of Standards, Boulder, Colo. Thermophysical Properties Div.
INVESTIGATION OF A PRACTICAL SUPERCONDUCTOR WITH A COPPER MATRIX Annual Report
F. R. Fickett Dec. 1978 110 p refs Sponsored in part by International Copper Research Association
Avail: NTIS HC A06/MF A01

A variety of techniques for producing superconducting wires from a copper-rich melt were investigated. The wires were then evaluated by measurement of their electrical and magnetic properties at low temperatures. Melting and processing techniques which showed some promise for relatively large scale application were studied in detail. Two additional related investigations are also described: (1) the evaluation of the very low temperature electrical and magnetic properties of specific CuSn and CuNi alloys which are used in various practical superconducting composites now on the market; and (2) a continuation of earlier work to identify the products of internal oxidation in dilute CuFe alloys, since this technique was shown to greatly reduce the resistivity of copper at low temperatures. A summary of the applications for superconducting magnets is also included. R.E.S.

N79-33398*# Siliconix, Inc., Santa Clara, Calif.
DEVELOPMENT AND FABRICATION OF LOW ON RESISTANCE HIGH CURRENT VERTICAL VMOS POWER FETs Final Report
Steeve Kay Aug. 1979 117 p refs
(Contract NAS8-21034)
(NASA-CR-159646) Avail: NTIS HC A06/MF A01 CSCL 09A

The design of a VMOS Power FET exhibiting low ON resistance, high current as well as high breakdown voltage and fast switching speeds is described. The design which is based on a 1st-order device model, features a novel polysilicon-gate structure and fieldplated groove termination to achieve high packing density and high breakdown voltage, respectively. One test chip, named VNTKI, can block 180 V at an ON resistence of 2.5 ohm. A 150 mil x 200 mil (.19 sq cm) experimental chip has demonstrated a breakdown voltage of 200 v, an ON resistence of 0.12 ohm, a switching time of less than 100 ns, and a pulsed drain - current of 50 A with 10 V gate drive. G.Y.

N79-33399# Varian Associates, Palo Alto, Calif. Solid State Lab.
SUBMICRON FET's USING MOLECULAR BEAM EPITAXY Annual Report, Aug. 1977 - Aug. 1978
S. G. Bandy, D. M. Collins, and C. Nishimoto 25 Jun. 1979 54 p refs
(Contract N00014-77-C-0655; NR Proj. 251-027)
(AD-A071396; AR-1) Avail: NTIS HC A04/MF A01 CSCL 09/1

Electron-beam exposure and MBE material have been used to achieve quarter-micron gate length GaAs FETs. A noise figure of 2.2 dB with an associated gain of 12 dB has been measured at 8 GHz. GRA

N79-33400# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
A STUDY OF METAL-SEMICONDUCTOR CONTACTS ON INDIUM PHOSPHIDE Final Technical Report, 1 Aug. 1977 - 30 Sep. 1978
G. Y. Robinson May 1979 51 p refs
(Contract F19628-77-C-0204; AF Proj. 2306)
(AD-A070792; RADC-TR-79-113) Avail: NTIS HC A04/MF A01 CSCL 20/12

The fundamental parameters which control the electrical and metallurgical properties of the metal/InP interface were investigated. Electrical measurements of the contact barrier energy and specific contact resistance were performed along with surface chemistry analysis using Auger electron microscopy. The results provide guidelines for the development of practical ohmnic contacts for use in InP devices, such as infrared detectors or field effect transistors. J.M.S.

N79-33401# Varian Associates, Palo Alto, Calif.
NONCOPLANAR HIGH POWER FET Annual Report, Jan. - Dec. 1977
S. G. Bandy, R. Sankaran, and D. M. Collins 15 Jan. 1979 26 p refs
(Contract N00014-75-C-0303)
(AD-A070702; AR-3) Avail: NTIS HC A03/MF A01 CSCL 09/5

By using a p(-) Ge-doped substrate and an MBE active layer, common-gate noncoplanar power FET devices were fabricated. Evaluation revealed that the most serious problem with this run was the poor leakage characteristics of the p-n junction gates. A noncoplanar device run was completed from start to finish for the first time. Cd autodoping in the vee and field growths necessitated going to p(-) Ge-doped substrates, and failure to grow continuous VPE active layers over the vees necessitated going to MBE active layer growth where a sputter clean could be done before growth. It was found that a W-Ti barrier was needed between the ohmic contacts and the overlay metal to preserve the low contact resistance and overlay conductivity. These first devices suffered from metallization breaks over the mesa edge, a conducting field growth and high gate leakage current. Consequently, no device characteristics were obtained from this run. GRA

N79-33402# Battelle Columbus Labs., Ohio.
STANDARD ELECTRONIC MODULE RADAR LIFE CYCLE COST COMPARISON Final Report, 1 Jun. 1978 - 15 Jan. 1979
Thomas R. Cork Apr. 1979 125 p refs
(Contract F33615-78-C-1508; AF Proj. 6096)
(AD-A071110; AFAL-TR-79-1025) Avail: NTIS HC A06/MF A01

The report presents a life cycle cost (LCC) analysis of an airborne weather radar system functionally similar to the Standard Electronic Module Radar (SEMR) and compares the LCC estimates for this system to previously developed LCC estimates for the SEMR. The SEMR has been designed, fabricated and tested as a demonstration of the concepts of the TRI-service Standard Electronic Module program. A previous study analyzed the LCC characteristics of the SEMR and developed LCC estimates for specific implementation alternatives. The APQ-122V(5) radar design was selected for LCC comparison as a representative example of solid state systems composed of custom subassemblies. The LCC analysis of a SEMR-equivalent of APQ-122 system was conducted using procedures and assumptions which were consistent with those used in the previous SEMR LCC study. Results presented in this report include a comparison of baseline LCC totals and subtotals, a comparison of the sensitivity of the two sets of LCC estimates to operational parameters, and an analysis of how the critical assumptions used in developing the SEMR equivalent APQ-122 LCC estimates affect the baseline comparison. The primary finding was that, when using available data and consistent analytical procedures, the baseline LCC estimates for the SEMR-equivalent APQ-122 system were approximately 40% lower than the SEMR estimates. Sensitivity analyses did not significantly alter this finding. GRA

N79-33403# Purdue Univ., Lafayette, Ind. Turner Lab. for Electroceramics.
THE EFFECTS OF SUBSTRATE COMPOSITION ON THICK FILM CIRCUIT RELIABILITY Quarterly Report, 2 Jan. - 30 Apr. 1979
R. W. Vest 31 May 1979 22 p refs
(Contract N00019-79-C-0240)
(AD-A071149; QR-1) Avail: NTIS HC A02/MF A01 CSCL 09/5

The high temperature surface tensions and viscosities of thick film glasses were measured as a function of temperature and the amount of AlSiMag 614 substrate dissolved in the glasses. The magnitude of the surface tension was observed to increase and the temperature coefficient of surface tension to decrease as the amount of dissolved substrate was increased. The ripening of RuO2 particles in thick film glasses was measured as a function of temperature and the amount of AlSiMag 614 substrate dissolved in the glasses. The ripening kinetics in all glass compositions were in agreement with a phase boundary reaction rate limiting step, and the rate constant was observed to decrease by a factor of 4 when the amount of dissolved substrate reached 10 weight percent. GRA

N79-33404# Naval Research Lab., Washington, D. C.
HIGH ACCURACY MICROWAVE S-PARAMETER MEASUREMENTS ON SOLID STATE DEVICES Interim Report
R. E. Neidert 22 Jun. 1979 16 p refs
(RR0210346)
(AD-A070735; NRL-MR-4015) Avail: NTIS HC A02/MF A01 CSCL 09/5

The absolute accuracy of automatic network analyzer measurement and de-imbedding of microwave S-parameters of solid state devices (diodes or transistors) is not easy to determine. A reasonable rule of thumb is that the fewer inaccurate measurements necessary to get at an answer, the more accurate the answer. The method outlined in this report, especially the low VSWR test equipment case (which uses only one measurement other than the one with the device in place), uses fewer measurements than any other method known. Because of this it is also possible that this measurement and de-imbedding method is the most accurate. GRA

N79-33405# Naval Ocean Systems Center, San Diego, Calif.
PARALLELED POWER SUPPLIES, A COMPARISON OF METHODS OF PARALLELING POWER SUPPLIES WITH THE METHOD USED IN THE AEGIS LOW-VOLTAGE POWER SYSTEM Final Report
C. W. Rosengrant Oct. 1978 30 p refs
(AD-A070969; NOSC/TR-329) Avail: NTIS HC A03/MF A01 CSCL 10/2

This report was prepared as part of the reliability studies of the AEGIS low-voltage power supply and compares methods of paralleling power supplies to determine the method most suitable for the AEGIS system. The two fundamental methods of paralleling power supplies are the automatic crossover method and master/slave method. The automatic crossover method has two subdivisions: (1) automatic crossover method (used by AEGIS system); and (2) the spoiler resistor method. The master/slave method has three subdivisions: (1) master pass element drive; (2) master voltage reference; and (3) current sense. The degree of current sharing that may be expected from these methods varies and depends on the method and how it was used. The automatic crossover method is characterized by unequal current sharing and closely regulated power supplies; however, if regulation can be sacrificed, a degree of current sharing may be achieved. The master/slave method theoretically offers equal current sharing but, because of inescapable component differences, only the current sense method offers a reliable method for achieving this. A comparison of the methods of paralleling power supplies show advantages and disadvantages for each. The master/slave method may have a slightly higher individual power supply reliability because of its equal load-sharing characteristics; however, this reliability advantage does not consider the additional control circuitry that would reduce reliability. GRA

N79-33406# Naval Research Lab., Washington, D. C.
FREQUENCY DEPENDENCE OF DIELECTRIC LOSS IN CONDENSED MATTER Memorandum Report, Nov. 1978 - Feb. 1979
K. L. Ngai and C. T. White 29 Jun. 1979 35 p refs Revised
(RR0110242)
(AD-A071426; NRL-MR-3863-Rev) Avail: NTIS HC A03/MF A01 CSCL 20/3

The dielectric response of condensed matter below microwave frequencies has been known to depart from the Debye behavior, sometimes to the point of being unrecognizable and yet the generally accepted interpretations of the departures have seldom deviated from the Debye philosophy of simple relaxation phenomena in non-interacting systems. It was recently recognized, from a synoptic view of the experimental data involving a wide range of materials, that there exists a remarkable universality of dielectric response behavior regardless of physical structure types of bonding, chemical type, polarizing species and geometrical configurations. This strongly suggests that there should exist a correspondingly universal mechanism of dielectric polarization in condensed matter. The present work proposes such a universal mechanism associated with the existence of some ubiquitous very low energy excitations in the system. These excitations exhibit an infrared divergent-like response to transitions of the polarizing species induced by a time-varying electric field in the dielectric and give rise to the universal dielectric response. GRA

N79-33407# BDM Corp., Albuquerque, N. Mex.
HANDBOOK OF MODELING FOR CIRCUIT ANALYSIS INCLUDING RADIATION EFFECTS Final Report

D. R. Alexander, P. A. Young, R. J. Antinone, and Robert Simon Kirtland AFB, N. Mex. AFWL May 1979 718 p refs
(Contract F29601-77-C-0026)
(AD-A071857; BDM/TAC-78-102-TR; AFWL-TR-79-86) Avail: NTIS HC A99/MF A01 CSCL 09/5

This handbook is a compilation and organization of previous research in computer modeling of semiconductor devices. It is designed to serve as a reference for the analyst who must analyze the effects of nuclear radiation on electronic circuits. It uses a modular approach wherein the analyst uses the simplest model which will yield the desired accuracy. The latest technology in representing second order effects is included in the handbook. The organization of the handbook proceeds from diodes to transistors, MOSFETs, IFETs, SCRs, UJTs, transformers and integrated circuits. The final chapter presents examples of computer aided analyses. GRA

N79-33408# Ex-Cal, Inc., Albuquerque, N. Mex. R/M Systems Div.
LONG-TERM DORMANT STORAGE OF MICROELECTRONIC COMPONENTS Interim Report, 8 Aug. 1977 - 28 Feb. 1978
R. H. Dickhaut and A. L. Dudley Jul. 1979 56 p
(Contract DAAK10-77-C-0122)
(AD-A071794) Avail: NTIS HC A04/MF A01 CSCL 09/1

An analysis is presented of the long-term dormant storage test data experimentally accumulated on two microelectronic devices. All relevant information on the experimental test program was reviewed very carefully. The existence of error sources, anomalous data, and data acquisition discontinuities was identified. The unanticipated final result of the analysis was that the data collected was of an insufficient quality to enable the identification of any aging behavior as a function of time, temperature, or operational stress. GRA

N79-33409# Mitre Corp., Bedford, Mass.
GENERALIZED CYCLIC CODES FINITE FIELD ARITHMETIC, VOLUME 3
T. F. Roome May 1979 68 p refs
(Contract F19628-78-C-0001; AF Proj. 7010)
(AD-A070873; MTR-3227-Vol-3; ESD-TR-79-124-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 09/2

The implementation of finite field arithmetic processing elements in charge-coupled device technology for cyclic error coding is investigated. The strong coupling between the capabilities of the multiple signal level charge-coupled device delay line and the structures needed for nonbinary finite field arithmetic algorithms is shown to have a potential for realizing resource efficient error control coding computational hardware. Laboratory results are described, and recommendations are made in areas where device characteristics require improvement to better meet the needs of the coding structures. GRA

N79-33410# Hughes Aircraft Co., Torrance, Calif. Electron Dynamics Div.
LOW BAND DUAL MODE TWT Final Report, 1 Apr. 1978 - 30 Apr. 1979
Matthew Patterson and Willard Sundquist 30 Apr. 1979 80 p
(Contract N00014-72-C-0205)
(AD-A071123; EDD-W-05082-F) Avail: NTIS HC A05/MF A01 CSCL 09/1

Several low band dual-mode guns were constructed with various grid configurations using standard grid construction techniques. These were tested in a beam analyzer to determine consistency of performance between guns of the same configuration and also to determine beam characteristics with different grid configurations (e.g. triode versus tetrode). In addition, a program was undertaken to produce low band dual-mode gun grid structures (tetrode) using a new manufacturing technique to increase dimensional accuracy. Two of these assemblies have been built. GRA

N79-33411# Cober Electronics, Inc., Stamford, Conn.
HIGH VOLTAGE NANOSECOND PULSE GENERATORS Interim Technical Report, 1 Jul. 1978 - 30 Apr. 1979
C. Zavales Jul. 1979 31 p
(Contract DAAB07-77-C-2641; DA Proj. 1L7-62705-AH-94) (AD-A071344; DELET-TR-77-2641-4; ITR-4) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report covers the work performed during the period 1 July 1978 to 30 April 1979 to develop high voltage nanosecond pulse generators. Effort was concentrated on the Task III pulser, which requires a burst of square wave, 100 ns wide pulses, operating at the 1.3 kV level. The load is an electrooptic CdTe crystal. The technical approach combined a pair of wide bandwidth triodes, for charging and discharging the crystal capacitance, with a high speed VMOS as grid drivers. The pulser was constructed and tested. Results show that voltage output and waveforms, with a capacitive load to simulate the crystal, meets all requirements. Author (GRA)

N79-33412# Army Missile Research and Development Command, Redstone Arsenal, Ala. Engineering Lab.
THIN-FILM MICROCIRCUITS ON FLEXIBLE SUBSTRATES
D. V. Kerns, Jr., J. M. Kull, and V. W. Ruwe 24 Jan. 1979 22 p refs
(AD-A071326; DRDMI-E-79-9) Avail: NTIS HC A02/MF A01 CSCL 09/5

The feasibility of fabricating flexible thin-film circuits while planar, and then folding or rolling the circuits to conform to packaging constraints was investigated. This approach would significantly increase microcircuit packing density and offer a new dimension to the thin-film circuit engineer. The flexible substrate used was the polyimide film, Kapton; identical circuits were also fabricated on borosilicate glass substrates for comparison. The conductor-resistor arrays used a new material system (copper/Kanthal) offering low cost, low temperature coefficient resistors, and a simple fabrication process. The flexible thin-film resistors were found to show very small resistor value changes when flexed (average about 0.2% for 1-cm radius of curvature), and resistor temperature coefficients comparable to those on glass substrates. This work suggests that flexible thin-film substrates may help solve complex thin-film microcircuit packaging problems. Author (GRA)

N79-33413# Los Alamos Scientific Lab., N. Mex.
ADVANCES IN HIGH POWER rf AMPLIFIERS
P. J. Tallerico 1979 6 p refs Presented at IEEE Particle Accelerator Conf., San Francisco, Calif., 12-14 Mar. 1979
(Contract W-7405-eng-36)
(LA-UR-79-705; Conf-790327-21) Avail: NTIS HC A02/MF A01

The state of the art for three types of amplifiers (gridded tubes, klystrons, and gyrocons) is considered and the development work necessary to improve each is discussed. The gyrocon is a new device, hence its various embodiments are dicussed in detail. The Soviet designs are reviewed and the gyrocon's strengths and weaknesses are compared to other types of microwave amplifiers. The primary advantages of the gyrocon are the very large amount of power available from a single device and the excellent efficiency and stable operation. DOE

N79-33414# California Univ., Berkeley. Lawrence Berkeley Lab.
MULTICHANNEL ANALOG TO DIGITAL CONVERTER AND READOUT SYSTEM FOR THE TIME PROJECTION CHAMBER
Michael R. Maier, S. R. Olson, M. Nakamura, and F. S. Goulding Oct. 1978 9 p refs Presented at the IEEE Nucl. Sci. Symp., Washington, D. C., 18-20 Oct. 1978
(Contract W-7405-eng-48)
(LBL-8136; Conf-781033-43) Avail: NTIS HC A02/MF A01

A low cost, multichannel analog to digital converters (ADC) and readout system was designed, which meets all the requirements imposed by the time projection chamber detector. All signals in every channel are digitized, thereby avoiding the difficulties associated with the multiplexing of many analog signals into the common ADC. Since the amplitude information is digitized by the same device, regardless of its amplitude, there is only one calibration necessary for each channel. The digital information is available after a reasonably short time (41 mus), and all further data processing can be done with digital numbers. This allows elimination of invalid information, i.e., zeros, very early in the signal processing, and therefore reduces the demands on the readout system. J.M.S.

N79-33415# California Univ., Berkeley. Lawrence Berkeley Lab.
WIDE-BAND MEASURING SYSTEM FOR STUDYING CHARGE-COUPLED DEVICE CHARACTERISTICS
Branko Leskovar and C. C. Lo Jan. 1979 8 p refs Presented at IEEE Nucl. Sci. Symp., Washington, D. C., 18 Oct. 1978
(Contract W-7405-eng-48)
(LBL-7590; Conf-781033) Avail: NTIS HC A02/MF A01

A wide-band four-channel measuring system was developed for studying charge-coupled devices and optimizing their characteristics. The system incorporates a high-to-low frequency processor capable of handling the 100 to 300 MHz high frequency clock CCD driver and generating the 0.5 to 10 MHz readout frequency, a microwave component based on a four-phase signal generator, a four-channel phase-matched RF power amplifier and a wide band CCD test fixture. DOE

N79-33416# Los Alamos Scientific Lab., N. Mex.
LOW-NOISE AUDIO AMPLIFIERS AND PREAMPLIFIER FOR USE WITH INTRINSIC THERMOCOUPLES
Gerald C. Langner, Robert D. Sachs, and Fred L. Stewart Mar. 1979 18 p refs
(Contract W-7405-eng-36)
(LA-7562) Avail: NTIS HC A02/MF A01

Two simple, low-noise audio amplifiers and one low-noise preamplifier for use with intrinsic thermocouples were designed, built, and tested. One amplifier uses ultralow-noise operational amplifiers; the other amplifier uses a hybrid component. The preamplifier uses ultralow-noise discrete components. The amplifiers' equivalent noise inputs, at maximum gain, are 4.09 nV and 50 nV; the preamplifier's input is 4.05 micro-V. Their bandwidths are 15,600 Hz, 550 Hz, and 174 kHz, respectively. The amplifiers' equivalent noise inputs were measured from approximately 0 to 100 Hz, whereas the preamplifier's equivalent noise input was measured from approximately 0 to 174 kHz. DOE

N79-33417# National Bureau of Standards, Washington, D. C. Electron Devices Div.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: A PRODUCTION-COMPATIBLE MICROELECTRONIC TEST PATTERN FOR EVALUATING PHOTOMASK MISALIGNMENT Interim Report, Jan. 1977 - Dec. 1978
T. J. Russell and D. A. Maxwell Apr. 1979 32 p refs
(ARPA Order 2397)
(PB-295199/4; NBS-SP-400-51) Avail: NTIS HC A03/MF A01 CSCL 14B

A pattern suitable for use in evaluating misalignment which may result from photomask generation, photomask exposure, or other fabrication processes is described. The test structures that are included in the pattern are included along with an explanation of how each of the structures is measured. GRA

N79-33418# National Bureau of Standards, Boulder, Colo. Instrument Shops Div.
CONSTRUCTION OF A LARGE TRANSVERSE ELECTROMAGNETIC CELL
W. F. Decker Washington Feb. 1979 89 p
(PB-295517/7; NBS-TN-1011) Avail: NTIS HC A05/MF A01 CSCL 14B

In support of the electromagnetic interference studies underway in the Electromagnetic Fields Division of the National Bureau of Standards, a 2.8 meter transverse electromagnetic (TEM) cell was constructed by the Instrument Shops Division of the NBS Boulder Laboratories. The cell requirements, design concepts, and fabrication procedures were developed through the coordination of both the Electromagnetic Fields Division personnel and the Instrument Shops Division personnel. The sequential procedure used to fabricate this cell, in conjunction with a complete set of detail and assembly drawings used to illustrate the complete fabrication process are provided. Documented information sufficient for any outside vendor, with the proper facilities, to construct a similar TEM cell are reported. GRA

N79-33419# National Bureau of Standards, Washington, D. C. National Engineering Lab.
THE DEVELOPMENT OF TEST STRUCTURES FOR CHARACTERIZATION OF THE FABRICATION AND PERFORMANCE OF RADIATION-HARDENED CCD IMAGERS Final Report, 1 Mar. - 30 Nov. 1978
G. P. Carver and M. G. Buehler May 1979 55 p refs Prepared for Charles Stark Draper Lab., Inc., Cambridge, Mass.
(PB-296167/0; NBSIR-79-1744) Avail: NTIS HC A04/MF A01 CSCL 09A

The proposed test structures described include advanced test structures which were developed during this program, improved versions of existing NBS test structures, and various other commonly used test structures. Some of the designs for structures were modified for compatibility with the radiation-hardened processes and with radiation testing. Procedures are described for testing the test structures using high-speed computer-controlled data acquistion techniques. Two of the test structures developed for this program represent new and unique test vehicles which allow the determination of relevant physical parameters which are difficult to obtain by other methods. GRA

N79-33420# National Technical Information Service, Springfield, Va.
AMORPHOUS SEMICONDUCTORS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1974 - Jun. 1979
Brian Carrigan Jun. 1979 175 p Supersedes NTIS/PS-78/0617; NTIS/PS-77/0554; NTIS/PS-76/0372; NTIS/PS-75/368; and COM-73-11705
(NTIS/PS-79/0623/3; NTIS/PS-78/0617; NTIS/PS-77/0554; NTIS/PS-76/0372; NTIS/PS-75/368; COM-73-11705) Avail: NTIS HC $28.00/MF $28.00 CSCL 20L

Abstracts are presented on amorphous semiconducting thin films, chalcogenides, material fabrication, properties, and testing. Amorphous semiconductor usage in electronic devices, laser materials, ovonic switches, and memory devices are included. This updated bibliography contains 170 abstracts, 18 of which are new entries to the previous edition. GRA

N79-33421# National Technical Information Service, Springfield, Va.
INTEGRATED CIRCUIT RELIABILITY, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Apr. 1976 - May 1979
William E. Reed Jun. 1979 181 p Supersedes NTIS/PS-78/0579; NTIS/PS-77/0486; NTIS/PS-76/0368; and NTIS/PS-75/247
(NTIS/PS-79/0602/7; NTIS/PS-78/0579; NTIS/PS-77/0486; NTIS/PS-76/0368; NTIS/PS-75/247) Avail: NTIS HC $28.00/MF $28.00 CSCL 09E

The bibliography presents research pertinent to design, reliability prediction, failure and malfunction, processing techniques, and radiation damage. This updated bibliography contains 176 abstracts, 30 of which are new entries to the previous edition. GRA

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N79-33422 Rice Univ., Houston, Tex.
EXPERIMENTAL INVESTIGATION OF CONVECTIVE INSTABILITIES IN A TWO-DIMENSIONAL FLUIDIZED-BED Ph.D. Thesis
Gopal Prasad Agarwal 1978 117 p
Avail: Univ. Microfilms Order No. 7919558

The theoretical stability of a two-dimensional fluidized system was analyzed against small disturbances. It was determined that the system was unstable if the pressure drop across the bed support was insufficient. The instability in the system resulted in a convective circulation cell reminiscent of Benard convection in heat transfer. A two-dimensional fluidized bed was then designed and systematic variations of the bed parameters and

bed support characteristics were made. General observations of the experiments are in good agreement with the theoretical predictions. Dissert. Abstr.

N79-33423 Wisconsin Univ. - Milwaukee.
VELOCITY CHANGES AND WEAK MIXING FOR ERGODIC FLOWS Ph.D. Thesis
David Walter Yurchak 1979 116 p
Avail: Univ. Microfilms Order No. 7923457

Changes of velocity for flows, especially those that change an ergodic flow into a weakly mixing flow, were examined. The special representation of flows as those built under function is used, and consideration is given primarily to changes of velocity that can be made by means of continuous cocycles. It is shown that if the base transformation of a flow is a shift by an irrational and the ceiling function is continuous, a continuous cocycle can always be found so that the new flow is weakly mixing. Conditions equivalent to a flow being weakly mixing, when the flow is represented as one built under a function, are found. These described the combined behavior of the ceiling function and the base transformation needed to have a weakly mixing flow. Dissert. Abstr.

N79-33424 Texas A&M Univ., College Station.
EFFECTS OF TURBULENCE ON THE ESTIMATION OF HORIZONTAL VELOCITY GRADIENTS FROM LAGRANGIAN MEASUREMENTS Ph.D. Thesis
Charles Eugene Abel 1979 109 p
Avail: Univ. Microfilms Order No. 7919046

A sequence of 16 computer simulations of drifters in shear flow are used to provide input data to a linear regression estimator for horizontal velocity gradients. The only source of error considered is turbulence, which is incorporated into the simulations through a specified Eulerian spatial correlation matrix for turbulent velocity in a plane. A model is developed from an approximation to the covariance matrix of the regression estimator. Expressions valid at large times are derived in which both cross-stream and downstream gradient variances are shown to depend on number of drifters, elapsed time of dispersion, value of the mean shear, and the time scales of the Lagrangian correlation matrix. These expressions agree with values obtained from the simulations, indicating the essential validity of the model, subject to the constraints implicit in development of the asymptotic relations. Dissert. Abstr.

N79-33425 Texas A&M Univ., College Station.
WAVE FORCES BY NUMERICAL SIMULATION Ph.D. Thesis
Harold Corbett Alexander 1979 268 p
Avail: Univ. Microfilms Order No. 7919049

A numerical technique is presented which determines the forces on submerged structures due to surface gravity waves. The variation of the total forces and the pressure distribution on a rectangular and a semi-circular structure are obtained as functions of the wave position. The numerical technique used is based on an algorithm. This code uses an Eulerian finite-difference formulation, with pressure and velocity as the primary variables to solve the full Navier-Stokes equations for an incompressible fluid. The code is modified and used for studying the transient as well as the steady state fluid-structure interaction problem. Changes in the code involve the use of a realistic value for viscosity and improved field and structure boundary conditions. The application of boundary conditions to a circular structure is presented in detail. The wave form and water particle kinematics by this numerical scheme are evaluated and compared with the work of other investigators. Dissert. Abstr.

N79-33426 Rice Univ., Houston, Tex.
FINITE ELEMENT SOLUTIONS OF THREE DIMENSIONAL CREEPING FLOWS Ph.D. Thesis
Shaw-Wen Lin 1979 200 p
Avail: Univ. Microfilms Order No. 7919608

Two different types of finite element solutions of the creeping flow equations were obtained. A semi-analytical finite element solution was developed for flows with axisymmetric geometrical configuration and used to analyze the flow for spherical particle in a simple shear flow for which an analytical solution exists. The exact solution verified the accuracy of the procedure. A finite element solution of flow with arbitrary geometrical boundary was formulated using a Cartesian coordinate system to yield a symmetric stiffness matrix for the finite element equations. This procedure was verified by analytical and other numerical solutions of the entry flow in a circular pipe and a leaf shaped pipe. The finite element procedure was used to investigate the peristaltic transport of urine in nonoccluded and occluded ureteral models. Velocity and pressure distributions were calculated for the ureteral models with wavelengths equal to 15 mm and 30 mm, respectively. Dissert. Abstr.

N79-33427 Colorado Univ. at Boulder.
STABILITY OF COAXIAL JET-VORTEX SYSTEMS IN A RIGID CONTAINER WITH AND WITHOUT AXIAL CURRENT Ph.D. Thesis
Kanwal Singh Yadava 1979 82 p
Avail: Univ. Microfilms Order No. 7923303

An axisymmetric jet of uniform velocity and uniform fluid density surrounded by a potential vortex of uniform fluid density which may be different from the fluid density of the jet is considered. The fluid density changes discontinuously across the fluid surface. The jet may carry electric current. The system is surrounded by a rigid cylinder of arbitrary diameter. The stability of jet-vortex system is analyzed for axisymmetric and non-axisymmetric disturbances of all wavenumbers. The parameters considered are the ratios of axial velocity to swirl velocity, the jet fluid density to swirl fluid density, the jet diameter to container diameter, and other non-dimensional parameters involving electric current. The analysis is carried out theoretically in terms of known functions and the final results are shown in graphical form for some typical ranges of parameters. Dissert. Abstr.

N79-33428 California Univ., Los Angeles.
GENERAL RELATIVISTIC THEORY OF PERTURBATIONS IN A PERFECT FLUID AND THE POSSIBILITY OF LANDAU DAMPING OF GRAVITATIONAL RADIATION Ph.D. Thesis
Stephen Jay Gayer 1979 112 p
Avail: Univ. Microfilms Order No. 7921403

Linear perturbation theory is applied to the problem of the modes in a perfect fluid as described by a self-consistent general relativistic theory and to the problem of Landau damping of gravitational radiation in a collisionless gas, also a self-consistent general relativistic analysis. A spatially flat Robertson Walker metric is used in the calculations. The treatment of fluid perturbations is done in a different gauge than previously published work. The treatment of Landau damping finds that gravitational waves in matter obey the same dispersion relation as light in a vacuum of similar space-time structure. The conclusions are that linear theory predicts only non-dispersive sound modes and vacuum-like gravitational waves in a perfect fluid. Landau damping is not possible due to the light-speed of gravitational waves. Dissert. Abstr.

N79-33429 Miami Univ., Coral Gables, Fla.
LUMPED PARAMETER ANALYSIS OF TWO-PHASE FLOW INSTABILITIES Ph.D. Thesis
Tashin Dogan 1979 183 p
Avail: Univ. Microfilms Order No. 7921747

A numerical model was developed to predict both the steady state and transient behavior of boiling two phase flow systems. Results of experimental work with a forced convection boiling Freon-11 loop show good agreement with the model's predictions. Steady state operating characteristics and stable and unstable regions were determined for ranges of heat flux, inlet subcooling, and mass flow rate. Different modes of oscillations and their characteristics were also identified. Pressure drop oscillations were confined to operating conditions where delta p/delta m $<$ 0. Density-wave oscillations were observed on the positive slope region of the pressure drop versus mass flow rate curve and at exit mixture qualities approaching unity. The study proved that a homogeneous flow model is adequate for most of the two phase flow problems regarding the steady state as well as the transient behaviour of such systems. Dissert. Abstr.

N79-33430 Ohio State Univ., Columbus.
STABILITY OF NATURAL CONVECTION OF THE CONDUCTION REGIME FOR FLOW IN A VERTICAL ANNULUS Ph.D. Thesis

Inn Gui Choi 1979 128 p
Avail: Univ. Microfilms Order No. 7922467

The stability of natural convection between two isothermal vertical cylinders was investigated by using linear theory of hydrodynamic stability. It was found that for all Prandtl numbers, instability sets in as a wave travelling upward. For low Prandtl numbers, an increase of curvature stabilizes the flow, but the reverse is true for high Prandtl numbers. The theoretical prediction of the mode of instability was verified by observations of the flow. The critical Grashof number was determined by measurements of the heat transfer. The experimental results are in good agreement with the theory. Dissert. Abstr.

N79-33431# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
MECHANICS OF BOUNDARY LAYER TRANSITION. PART 6: SPATIAL INSTABILITY IN LAMINAR FLOW
W. O. Criminale Jan. 1968 34 p refs Lecture held at Rhode-Saint-Genese, Belgium, 15-19 Jan. 1968
(VKI-Lecture-Series-3-Pt-6) Avail: NTIS HC A03/MF A01

The role of spatial instability in laminar flows is analyzed using linear stability theory. Calculations for the boundary layer, the effects of the inviscid jet and wake, the occurence of singularities, and the problem of inviscid free shear layer are considered. A.W.H.

N79-33432*# General Dynamics/Convair, San Diego, Calif.
STUDY OF LIQUID AND VAPOR FLOW INTO A CENTAUR CAPILLARY DEVICE
M. H. Blatt and J. A. Risberg Sep. 1979 161 p refs
(Contract NAS3-20092)
(NASA-CR-159657; GDC-NAS-79-001) Avail: NTIS HC A08/MF A01 CSCL 20D

The following areas of liquid and vapor flow were analyzed and experimentally evaluated; 1) the refilling of capillary devices with settled liquid, and 2) vapor flow across wetted screens. These investigations resulted in: 1) the development of a versatile computer program that was successfully correlated with test data and used to predict Centaur D-1S LO2 and LH2 start basket refilling; 2) the development of a semi-empirical model that was only partially correlated with data due to difficulties in obtaining repeatable test results. Also, a comparison was made to determine the best propellant management system for the Centaur D-1S vehicle. The comparison identified the basline Centaur D-1S system (using pressurization, boost pumps and propellant settling) as the best candidate based on payload weight penalty. However, other comparison criteria and advanced mission condition were identified where pressure fed systems, thermally subcooled boost pumps and capillary devices would be selected as attractive alternatives. R.E.S.

N79-33433*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENTS IN THE COMPUTATION OF TURBULENT BOUNDARY LAYERS
Morris W. Rubesin Washington Sep. 1979 26 p refs Presented at AGARD Symp. on Turbulent Boundary Layer - Experiment, Theory and Modelling, The Hague, 24-27 Sep. 1979
(NASA-TM-78620; A-7953) Avail: NTIS HC A03/MF A01 CSCL 20D

Computational techniques applicable to turbulent boundary layers are classified into solutions of Reynolds-averaged equations, in which all the effects of the turbulence are modelled, and solutions of three-dimensional, time dependent Navier-Stokes equations, in which the large eddies are calculated and only the turbulence at scales smaller than the computational mesh spacings has to be modelled. Current computation costs place engineering computations in the first of these categories; large eddy simulations are appropriate currently for special studies of the dynamical processes of turbulence in idealized flow fields. It is shown that the two methods are interrelated and that each can gain from advances in the other. The degree of success of a pair of increasingly complex Reynolds stress models to broaden their range of applicability is examined through comparisons with experimental data for a variety of flow conditions. An example of a large-eddy simulation is presented, compared with experimental results, and used to evaluate the models for pressure rate-of-strain correlations and dissipation in the Reynolds-averaged equations. Author

N79-33434*# CHAM of North America, Inc., Huntsville, Ala.
COMPUTER CODE FOR ANALYSING THREE-DIMENSIONAL VISCOUS FLOWS IN IMPELLER PASSAGES AND OTHER DUCT GEOMETRIES Final Report
D. G. Tatchell Sep. 1979 104 p refs
(Contract NAS8-33090)
(NASA-CR-161319; CHAM-1712/2) Avail: NTIS HC A06/MF A01 CSCL 20D

A code, CATHY3/M, was prepared and demonstrated by application to a sample case. The preparation is reviewed, a summary of the capabilities and main features of the code is given, and the sample case results are discussed. Recommendations for future use and development of the code are provided. K.L.

N79-33435# Von Karman Inst. for Fluid Dynamics, Rhode-Saint-Genese (Belgium).
VKI SHORT COURSE ON TURBULENT BOUNDARY LAYERS, MARCH 4-15, 1968. PART 1: INTRODUCTION TO TURBULENT BOUNDARY LAYER CALCULATION
J. C. Rotta (Aerodynamische Versuchsanstalt, Goettingen) Mar. 1968 70 p refs
(VKI-Lecture-Series-5-Pt-1) Avail: NTIS HC A04/MF A01

Turbulent boundary layers in a steady compressible flow on a plane, an impermeable wall, and on bodies of revolution in axial flow are examined with emphasis on the representation of the fundamental phenomena which form the basis for the treatment of more general cases. Topics dicussed include the principles of boundary layer theory; mechanics of turbulent shear flow; general behavior of turbulent boundary layers in incompressible flow and their calculation; and turbulent layers with heat transfer and incompressible flow. A.R.H.

N79-33436*# Aeronautical Research Associates of Princeton, Inc., N. J.
AN INVESTIGATION OF THE TURBULENCE SCALE TENSOR IN A FLAT-PLATE BOUNDARY LAYER Final Report
Roger D. Sullivan, Coleman duP. Donaldson, and Guido Sandri Jan. 1979 46 p refs
(Contract NAS2-8014)
(NASA-CR-152318; ARAP-378) Avail: NTIS HC A03/MF A01 CSCL 20D

A differential equation for the scale tensor in turbulent flow is developed from basic considerations and applied to the flow of a constant-density fluid in the boundary layer on a flat plate. Results from preliminary runs of a computer implementation are discussed. Author

N79-33437*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOME RECENT DEVELOPMENTS IN THE PREDICTION OF SHOCK INTERACTION PHENOMENA AT HYPERSONIC SPEEDS
Davis H. Crawford Washington Oct. 1979 41 p refs
(NASA-TM-80115; L-12669) Avail: NTIS HC A03/MF A01 CSCL 20D

The shock strengths for which either Edney type I or type II shock interference patterns can occur when two oblique shocks of opposite families intersect were determined graphically at Mach 10 by using logarithmic shock polar diagrams. The theoretical region of overlap for the two types of interaction was investigated by observing in the Schlieren system of the Langley 15-inch hypersonic flow apparatus the intersection of oblique shocks generated by two sharp 10 degree wedges as the wedge angles of attack and their relative positions were altered. A range of shock strengths for which either of the two interference patterns can exist was demonstrated. M.M.M.

N79-33438*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SURVEY AND BIBLIOGRAPHY ON ATTAINMENT OF LAMINAR FLOW CONTROL IN AIR USING PRESSURE GRADIENT AND SUCTION, VOLUME 1
Dennis M. Bushnell and Marie H. Tuttle Sep. 1979 346 p
(NASA-RP-1035; L-12528) Avail: NTIS HC A15/MF A01 CSCL 20D

A survey was conducted and a bibliography compiled on attainment of laminar flow in air through the use of favorable pressure gradient and suction. This report contains the survey, summaries of data for both ground and flight experiments, and abstracts of referenced reports. Much early information is also included which may be of some immediate use as background material for LFC applications. G.Y.

N79-33439# California Inst. of Tech., Pasadena. Hydrodynamics Lab.

FLAPPED HYDROFOIL TESTS: WATER TUNNEL TESTS OF THE NACA 64A-309 FOIL SECTION FITTED WITH AN ADJUSTABLE FLAP IN FULLY-WETTED AND CAVITATING FLOWS Technical Report, 4 Dec. 1978 - 12 Jan. 1979

Paul Baloga 8 Aug. 1979 82 p
(Contract N00014-77-C-0497; NR Proj. 062-581)
(GALCIT-HSWT-1131) Avail: NTIS HC A05/MF A01

Lift, drag and pitching moment data for a NACA 64A-309 foil section fitted with a plain sealed flap are presented. The flap hinge axis was located at the three-quarter chord point. The influence of positive and negative flap angles on the data was evaluated in fully wetted and cavitating flows. The data were taken in the two dimensional working section of the GALCIT High Speed Water Tunnel. Author

N79-33440*# Illinois Inst. of Tech., Chicago.

EVALUATION OF A NEW CONCEPT FOR REDUCING FREE-STREAM TURBULENCE IN WIND TUNNELS

Roald A. Wigeland, Jimmy Tan-atichat, and Hassan M. Nagib Oct. 1979 49 p refs
(Grant NsG-1451)
(NASA-CR-3196; R79-1) Avail: NTIS HC A03/MF A01 CSCL 20D

The feasibility of using a 45 deg-honeycomb for improving the flow quality in wind tunnels was investigated. The results of the experiments indicate that the turbulence levels in a wind tunnel using the 45 deg-honeycomb would be comparable to those obtainable using a conventional honeycomb, i.e., a honeycomb which is positioned normal to the mean flow in the settling chamber. However, this is true only when a 45 deg-screen is mounted immediately downstream of the honeycomb, and when some distance is provided between the trailing edges of the corner turning vanes and the upstream side of the 45 deg-honeycomb. This distance is required for adequate decay of the turning-vane wakes, thereby providing a reasonably uniform mean flow entering the honeycomb. Results demonstrate that this distance should be at least twice the spacing between the turning vanes. Even though the resulting turbulence intensity is the same downstream of both the 45 deg-honeycomb and the conventional honeycomb, there would have to be a significant improvement in the test-section turbulence intensity using the 45 deg-honeycomb to justify the additional expense in fabricating and installing this type of honeycomb. J.M.S.

N79-33441*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

A HYBRIDIZED METHOD FOR COMPUTING HIGH-REYNOLDS-NUMBER HYPERSONIC FLOW ABOUT BLUNT BODIES

K. James Weilmuenster and H. Harris Hamilton, II Washington Oct. 1979 49 p refs
(NASA-TP-1497; L-12946) Avail: NTIS HC A03/MF A01 CSCL 01A

A hybridized method for computing the flow about blunt bodies is presented. In this method the flow field is split into its viscid and inviscid parts. The forebody flow field about a parabolic body is computed. For the viscous solution, the Navier-Stokes equations are solved on orthogonal parabolic coordinates using explicit finite differencing. The inviscid flow is determined by using a Moretti type scheme in which the Euler equations are solved, using explicit finite differences, on a nonorthogonal coordinate system which uses the bow shock as an outer boundary. The two solutions are coupled along a common data line and are marched together in time until a converged solution is obtained. Computed results, when compared with experimental and analytical results, indicate the method works well over a wide range of Reynolds numbers and Mach numbers. Author

N79-33442# Army Cold Regions Research and Engineering Lab., Hanover, N. H.

TURBULENT HEAT TRANSFER IN LARGE ASPECT CHANNELS

F. D. Haynes and G. D. Ashton May 1979 11 p refs
(AD-A071003; CRREL-79-13) Avail: NTIS HC A02/MF A01 CSCL 20/13

Heat transfer in turbulent flow was measured in a rectangular channel with a width of 0.254 m and a flow depth of 0.0254 m. Correlations between the Nusselt and Reynolds numbers are given for a range of 30.20 $<$Re$<$ 22.360. A Prandtl number range of 9.90 less than or equal to Pr less than or equal to 12.28 for water was used in the tests. The results are compared with those of other investigations and show that some well-known correlations underpredict the heat transfer by about 35%. GRA

N79-33443# Delaware Univ., Newark. Applied Mathematics Inst.

THE APPROXIMATION OF SOLUTIONS TO THE BACKWARDS HEAT EQUATION BY SOLUTIONS OF PSEUDO-PARABOLIC EQUATIONS Interim Report

David Colton 1979 14 p refs
(Grants AF-AFOSR-2879-76; NSF MCS-78-02452)
(AD-A071096; AFOSR-79-0814TR) Avail: NTIS HC A02/MF A01 CSCL 20/13

It is well known that solutions of the backwards heat equation can be approximated by solutions of a pseudoparabolic equation depending on a small parameter (epsilon). The emphasis in this paper is on the mathematical problems which arise in approximating solutions to initial-boundary value problems for this perturbed equation. The approximation procedure we propose is obtained through the development of a potential theory for pseudoparabolic equations, the asymptotic evaluation of certain contour integrals, and results based on a theorem of Levin in the theory of entire functions. GRA

N79-33444# Sandia Labs., Albuquerque, N. Mex.

FINITE ELEMENT ANALYSIS OF SEVERAL STANDARD FLOW PROBLEMS

D. K. Gartling 1978 18 p refs Presented at Conf. on Numerical Methods in Laminar and Turbulent Flow, Swansea, Wales, 17-21 Jul. 1978
(Contract EY-76-C-04-0789)
(SAND-78-1360C; Conf-780712-5) Avail: NTIS HC A02/MF A01

As a part of the International Conference on Numerical Methods in Laminar and Turbulent Flow (Swansea, Wales 1978), a series of six standard problems were developed. Results obtained from a finite element computer program for three of the test problems are presented. DOE

N79-33445# California Univ., Livermore. Lawrence Livermore Lab.

WAVE RESISTANCE IN A ROTATING LIQUID LAYER

J. A. Viecelli Mar. 1979 12 p refs Presented at 3d Workshop on Rotating Gases, Rome, Italy, 27-29 Mar. 1979
(Contract W-7405-eng-48)
(UCRL-82436; Conf-790329-1) Avail: NTIS HC A02/MF A01

The unstable motion of a rotor containing a thin liquid layer results from the reaction forces exerted by the liquid in response to motion of the rotor. A numerical solution for the liquid displacement and pressure resulting from a traveling wave motion of the container walls is presented. The solution gives the liquid pressure force on the rotor wall as a function of Reynolds number, number of wave nodes, and the ratio of the wall displacement amplitude to liquid depth. The behavior in the limit of vanishing wave speed is derived. DOE

N79-33446# California Univ., Livermore. Lawrence Livermore Lab.

VISCOUS EFFECTS ON A TURBULENT JET NEAR NOZZLE EXIT

Sang-Wook Kang Jan. 1979 8 p refs Presented at Ann. Meeting of the APS, N. Y., 29 Jan.-1 Feb. 1979

(Contract W-7405-eng-48)
(UCRL-81828; Conf-790153-1) Avail: NTIS HC A02/MF A01

The viscous effects on changes in the velocity profile of an incompressible turbulent jet exhausting into an immiscible ambient medium are analyzed. Under some simplifying conditions, a closed-form solution is obtained. The results demonstrate possible retardation of turbulent jet breakup due to viscous effects. DOE

N79-33447# Brookhaven National Lab., Upton, N. Y.
FLUCTUATIONS AND FREEZING IN A ONE-DIMENSIONAL LIQUID: Hg SUB 3-DELTA/AsF6
J. D. Axe 1979 17 p refs Presented at the NATO Advan. Study Inst. on Ordering in Strongly-Fluctuating Condensed-Matter Systems, Geilo, Norway, 16 Apr. 1979
(Contract EY-76-C-02-0016)
(BNL-26168; Conf-790487-2) Avail: NTIS HC A02/MF A01

Many papers deal quite properly with systems at their critical dimensionality, d^*. In such systems the competing forces between organization and disorder are nearly equally balanced and the analysis of the resulting situation requires some subtlety. Not surprisingly, the situation is somewhat simplified when the dimensionality falls below d^*. For ordinary translational ordering of fluids (i.e., crystallization), $d^* = 2$. The properties of certain quasi-one-dimensional systems are explored, which since they are effectively below d^*, resist the conventional crystalline order until abnormally low temperatures, and assume instead a state which is likened to a 1-dimensional liquid. DOE

N79-33448# New Mexico Univ., Albuquerque. Technology Applications Center.
CAVITATION FLOW. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Report, 1976 - May 1979
Gerald F. Zollars Jul. 1979 45 p Prepared for NTIS
(NTIS/PS-79/0652) Avail: NTIS HC $28.00/MF $28.00 CSCL 20D

This bibliography contains 193 citations from the international literature. Articles dealing with bubble behavior relating to two phase flow, oscillating flow, unsteady flow, wall flow, and flow stability are cited. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N79-33449* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WEDGE IMMERSED THERMISTOR BOLOMETERS Patent
Marc G. Dreyfus, inventor (to NASA) (Barnes Engineering Co., Stamford, Conn.) Issued 21 Jan. 1964 3 p Filed 29 Aug. 1961 Sponsored by NASA
(NASA-Case-XGS-01245-1; US-Patent-3,119,086; US-Patent-Appl-SN-134619; US-Patent-Class-338-18) Avail: US Patent and Trademark Office CSCL 14B

An immersed thermistor bolometer for the detection of ultraviolet, visible, and infrared radiation is described. Two types of immersed bolometers are discussed. The immersion of thermistor flakes in a lens, or half immersed by optical contact on a lens, is examined. Lens materials are evaluated for optimum immersion including fused aluminum oxide, beryllium oxide, and germanium. The application of the bolometer to instruments in which the entrance pupil of the immersion optics has a high aspect ratio is considered. A.W.H.

N79-33450* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BAKEABLE MCLEOD GAUGE Patent
Wallace S. Kreisman, inventor (to NASA) (Geophysics Corp. of America, Bedford, Mass.) Issued 22 Jun. 1965 6 p Filed 7 Nov. 1961 Sponsored by NASA
(NASA-Case-XGS-01293-1; US-Patent-3,190,124; US-Patent-Appl-SN-150690; US-Patent-Class-73-400) Avail: US Patent and Trademark Office CSCL 14B

A low pressure gauge of the McLeod type demonstrating superior performance and measuring characteristics is described. A mercury reservoir which is kept in a vacuum at all times as well as bakeable glass components to reduce contamination are featured.

Official Gazette of the U.S. Patent and Trademark Office

N79-33451*# Perkin-Elmer Corp., Pomona, Calif. Aerospace Div.
THE ADDITION OF EI/CI CAPABILITY TO THE MATTAUCH-HERZOG SPECTROGRAPH WITH EOID Final Report
G. J. Fergusson and M. E. Koslin Aug. 1979 68 p Prepared for JPL
(Contracts NAS7-100; JPL-954464)
(NASA-CR-162363) Avail: NTIS HC A04/MF A01 CSCL 14B

A modification was made to the Mattauch-Herzog Spectrograph with an electro-optical ion detector (EOID) previously designed and constructed, so that it would be capable of operating not only in the electron-impact (EI) mode of ionization, but also in the chemical ionization (CI) mode. This modification necessitated an effort in three specific design areas: (1) sample inlet; (2) ion source and analyzer regions; and (3) the pumping system. In addition, an appropriate electronics package had to be designed to control and operate the combined EI/CI source. G.Y.

N79-33452*# National Aeronautics and Space Administration, Washington, D. C.
USE OF PIEZOELECTRIC MULTICOMPONENT FORCE MEASURING DEVICES IN FLUID MECHANICS
A. Richter and K. Stefan Sep. 1979 15 p refs Transl. into ENGLISH from Arch. fuer Tech. Mess. Messentech. Prax. (West Germany), no. 446, Mar. 1973 p 41 -44 Original language document was announced as A73-27871 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75444) Avail: NTIS HC A02/MF A01 CSCL 14B

The characterisitics of piezoelectric multicomponenet transducers are discussed, giving attention to the advantages of quartz over other materials. The main advantage of piezoelectric devices in aerodynamic studies is their ability to indicate rapid changes in the values of physical parameters. Problems in the accuracy of measurments by piezoelectric devices can be overcome by suitable design approaches. A practical example is given of how such can be utilized to measure rapid fluctuations of fluid forces exerted on a circular cylinder mounted in a water channel.

Author

N79-33453# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
DEVELOPMENT OF CALORIMETRIC FATIGUE GAUGE Final Report
John M. Papazian, Richard Delasi, and Philip N. Adler May 1979 40 p refs
(Contract N00019-76-C-0651)
(AD-A070844; RE-572) Avail: NTIS HC A03/MF A01 CSCL 20/11

A research effort to devise a new fatigue gauge for aircraft is described in this report. Differential scanning calorimetry was used to detect microstructural changes resulting from strain-controlled fatigue exposure of aluminum alloy 7050. The calorimetric signature of the microstructure was determined for samples that had been cycled to failure at strains of -0.3, -0.6, and -1.5%. Some samples were also fatigued to failure with a small positive or negative mean strain offset, and others were cycled to 30% or 70% of their expected life at -1.5%. Thermodynamic and kinetic analyses of the calorimetric results revealed a pronounced effect of fatigue at -1.5% strain on the reaction enthalpy and reaction kinetics of the GP zone dissolution peak. The reaction enthalpy decreased systematically as the number of cycles increased. No effects of fatigue on the calorimetric results were observed in the samples that were fatigued at -0.3

and -0.6%. Based upon these results the characteristics of a potential 'calorimetric fatigue gauge' were outlined. Such a gauge would only be sensitive to low cycle 'plastic' fatigue and would produce a cumulative damage parameter, thus indicating the percentage of lifetime expended. GRA

N79-33454# Brown (Neil) Instrument Systems, Inc., Catawmet, Mass.
THREE AXIS ACOUSTIC CURRENT METER
10 May 1979 242 p refs
(Contract N00014-75-C-0113)
(AD-A070721) Avail: NTIS HC A11/MF A01 CSCL 14/2

During the first phase of this contract, design concepts and prototype hardware were generated, leading to a successful demonstration of the capabilities of an acoustic phase shift velocity sensor. Success of the initial feasibility-study phase of this development program led to an extension of the scope of contract to include design and fabrication of sea-worthy moored current meters. Work to this end began in 1976 and led to production of three units configured to specific requirements of the NOAA National Data Buoy Office. These units were tested extensively by the Test and Evaluation Laboratory of NOAA. The three prototype current meters fabricated pursuant to contract have been repeatedly and successfully deployed by National Data Buoy Office. These deployments have proved the accuracy and reliability of the design and its suitability for use under arduous conditions. The successful outcome of the second phase of contract development encouraged Neil Brown Instrument Systems, Inc. to continue work on moored current meter design and has resulted in the instrument described within the body of this report. At least twenty of these units have undergone testing and deployment, with results which though preliminary, are extremely encouraging. GRA

N79-33455# Los Alamos Scientific Lab., N. Mex.
FIBER-OPTIC COUPLED PRESSURE TRANSDUCER
Charles R. Tallman, Frank P. Wingate, and Evan O. Ballard 1979 11 p refs Presented at the 25th ISA Intern. Instr. Symp., Anaheim, Calif., 6-10 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-548; Conf-790505-13) Avail: NTIS HC A02/MF A01

A fiber-optic coupled pressure transducer was developed for measurement of pressure transients produced by fast electrical discharges in laser cavities. The transducer design and performance are described in detail. Shock tube performance and measurements in direct electrical discharge regions are presented. DOE

N79-33456# Sandia Corp., Livermore, Calif.
EVALUATION OF THE OMNI SPECTRA MODEL 100 MICROWAVE MOTION DETECTION SYSTEM
W. P. Brigham and J. D. Williams, ed. Jan. 1979 56 p ref
(Contract DE-AC04-76DP-00789)
(SAND-79-0053) Avail: NTIS HC A04/MF A01

Tests were performed on the model to determine sensor detection patterns and to quantitate the effects of intruder velocity. System susceptibility to fluorescent lights, oscillatory motion, and environmental factors was also examined. DOE

N79-33457# Colorado Univ. at Boulder. Dept. of Electrical Engineering.
VARIATIONAL EXPRESSION FOR THE SCATTERING MATRIX OF A COAXIAL LINE STEP DISCONTINUITY AND ITS APPLICATION TO AN OVER MODED COAXIAL TEM CELL Progress Report, Aug. 1978 - Jan. 1979
I. Sreenivasiah and David C. Chang May 1979 48 p refs Sponsored by Natl. Bureau of Standards
(PB-296324/7; NBSIR-79-1606) Avail: NTIS HC A03/MF A01 CSCL 14B

A step discontinuity in a coaxial transmission line, where one of the sections is large enough to support both TEM and TM(01) modes, may be modeled as a 3-port junction. A variational expression for the (3x3) scattering matrix of such a junction is obtained in simple closed form. The scattering matrix, so obtained, is used to analyze the transmission characteristics of a coaxial TEM cell beyond the cutoff point of the TM(01) mode. Finally, an equivalent circuit, along with the expressions for the circuit parameters, is given for the general case where the number of propagating modes in each section is finite but arbitrary. GRA

N79-33458# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
CALIBRATING A SIX-PORT REFLECTOMETER WITH FOUR IMPEDANCE STANDARDS
Cletus A. Hoer Mar. 1979 23 p refs
(PB-294992/3; NBS-TN-1012) Avail: NTIS HC A02/MF A01 CSCL 14B

A theoretical study showing how four terminations of known impedance can be used to calibrate a six-port reflectometer for measuring other terminations of unknown impedance is presented. The equations for obtaining the calibration constants are exact but nonlinear, requiring an iterative solution. Several ways are described for using these constants to calculate the impedance of terminations being measured with the six-port reflectometer. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N79-33459 California Inst. of Tech., Pasadena.
ELECTRONIC AND KINETIC PROCESSES IN THE Cu/CuCl DOUBLE PULSE LASER Ph.D. Thesis
Mark Jay Kushner 1979 264 p
Avail: Univ. Microfilms Order No. 7919852

Kinetic and electronic processes in a Cu/CuCl double pulsed laser were investigated by measuring discharge and laser pulse characteristics and by computer modeling. It was found that the character of the pumping pulse is largely determined by the initial conditions provided by the interpulse afterglow. By tailoring the dissociation pulse to be long and low energy, and by conditioning the afterglow, one may select the desired initial conditions and thereby significantly improve laser performance. Computer models for the dissociation pulse, afterglow, pumping pulse and laser pulse reproduced experimentally observed behavior of laser pulse energy and power as a function of time delay, pumping pulse characteristics, and buffer gas pressure. The sensitivity of laser pulse properties on collisional processes was investigated. Dissert. Abstr.

N79-33460# Naval Research Lab., Washington, D. C. Plasma Physics Div.
THE ELECTRON CYCLOTRON MASER AS A HIGH-POWER TRAVELLING-WAVE AMPLIFIER OF MILLIMETER WAVES Interim Report
J. L. Seftor, V. L. Granatstein, K. R. Chu, P. Sprangle, and M. Read 19 Jun. 1979 29 p refs
(AD-A071087; NRL-MR-3989) Avail: NTIS HC A03/MF A01 CSCL 20/5

The electron cyclotron maser instability has been exploited as the basis for a new type of travelling wave amplifier which operates at unusually high power levels at millimeter wavelengths. The first experimental model of this amplifier has been operated at 35 GHz and has demonstrated a stable gain of 17 dB and an output power of 10 kW (unsaturated). The gain was linear over a dynamic range = 30 dB. The absolute value of the gain and its dependence on current and magnetic field were in excellent agreement with theoretical calculations. Bandwidth and saturated power have yet to be measured directly but no fundamental problems were observed which will prevent successful achievement of the design predictions (viz., bandwidth approximately 10%, power on the order of 100,000 watts, efficiency = 10%). GRA

N79-33461# Illinois Univ. at Urbana-Champaign. Electro-Physics Lab.
MULTIPLE PHOTON PUMPING OF MOLECULAR LASERS: FREQUENCY TUNABLE AND FAR IR LASERS Interim Report, 1 Feb. 1978 - 31 Jan. 1979
P. D. Coleman Apr. 1979 75 p refs
(Grant AF-AFOSR-2988-76; AF Proj. 2301)
(AD-A071018; UILU-ENG-79-2550) Avail: NTIS HC A04/MF A01 CSCL 20/5

This annual report describes research on two-photon pumping of molecular lasers operating on hot band transitions of the molecules and the associated nonlinear effects (Raman and hyper-Raman) that contribute to the gain spectrum of the molecular system. Accessing the hot bands of a molecule results in more lasing transitions that would otherwise be observed, and modifies the characteristics of the gain spectrum, i.e., the saturation, AC Stark shifts and width. Specific experiments described are: infrared-microwave pumping of NH3, infrared-infrared pumping on NH3, and hot band lasing in NH3. Ammonia has been chosen for study since it has both a rich known, so that absorption and laser assignments can readily be made.GRA

N79-33462# GTE Labs., Inc., Waltham, Mass.
NEW LASERS BASED ON TRANSITION METAL COMPLEXES Final Report, 1 Oct. 1976 - 1 Oct. 1978
L. Andrews, E. Johnson, and A. Lempicki Apr. 1979 69 p refs
(Contract F49620-77-C-0015; AF Proj. 2301)
(AD-A071023; TR-79-740.1) Avail: NTIS HC A04/MF A01 CSCL 20/5

The purpose of this program has been to investigate the possibility that luminescent transition metal complexes (TM complexes) might serve as the basis for a new class of lasers tunable in the visible spectral region. At the beginning of the program, sufficient spectroscopic and photophysical data were available to permit calculation of threshold requirements for these new materials, and they were found to lie well within the range of conventional pump sources. GRA

N79-33463# Westinghouse Research and Development Center, Pittsburgh, Pa.
TlHg LASER DEVELOPMENT PROGRAM Final Report, 1 Feb. 1978 - 31 Jan. 1979
C. S. Liu, R. K. Williams, and L. A. Weaver 10 Apr. 1979 23 p refs
(Contract N00014-78-C-0131)
(AD-A070823) Avail: NTIS HC A02/MF A01 CSCL 20/5

This report describes the results of an experimental study of the TlHg excimer system. A comparative evaluation of TlXe and TlHg candidates has indicated that the TlHg excimer is the most promising system for detailed study. An all-hot, sealed-off transverse discharge tube and a pressurized oven assembly have been fabricated and tested successfully. This experimental apparatus will permit the study of most metal excimer discharges at temperatures up to 1000 C and pressures up to 10 atm. Preliminary tests have shown that pulsed TlHg discharges suitable for excimer laser feasibility studies can be produced in the experimental apparatus. It is recommended that fluorescence and gain measurements of TlHg discharges proceed immediately, with laser tests to follow it warranted. GRA

N79-33464# California Univ., Livermore. Lawrence Livermore Lab.
LASER PROGRAM, VOLUME 1 Annual Report, 1977
Charles F. Bender, ed. and B. D. Jarman, ed. Jul. 1978 357 p refs
(Contract W-7405-eng-48)
(UCRL-500021-77-Vol-1) Avail: NTIS HC A16/MF A01

An overview is given of the laser fusion program. The solid-state program covers the Shiva and Nova projects. Laser components, control systems, alignment systems, laser beam diagnostics, power conditioning, and optical components are described. The fusion experimental program concerns the diagnostics and data acquisition associated with Argus and Shiva. DOE

N79-33465# Los Alamos Scientific Lab., N. Mex.
RESEARCH ON FISSION INDUCED PLASMAS AND NUCLEAR PUMPED LASERS AT THE LOS ALAMOS SCIENTIFIC LABORATORY
H. H. Helmick 1978 27 p refs Presented at 1st Symp. on Fission Induced Plasmas and Nucl. Pumped Lasers Meeting, Orsay, France, 23 May 1978
(Contract W-7405-eng-36)
(LA-UR-78-3018; Conf-780537-6) Avail: NTIS HC A03/MF A01

The gaseous fueled reactor system was assessed. Advances in certain technology areas must be accomplished before it will be possible to produce an engineering design for a gaseous fueled power station. Corrosion problems of fluorine and uranium hexafluoride with materials must be solved, however, recent advances indicate these problems are not insurmountable. The vortex flow of buffer gas confinement obviates the most severe environment in the flow system. The feasibility of such confinement was demonstrated successfully for small scale devices and the present experimental activity is aimed at demonstration of the principle in the reactor environment at moderate power levels. Concurrently, efforts are also being made to address the problems of adapting the gas core reactor concept to be used as a power supply for nuclear pumped lasers. DOE

N79-33466# National Bureau of Standards, Washington, D. C. Center for Radiation Research.
A SERVO CONTROLLED ELECTRO-OPTIC MODULATOR FOR cw LASER POWER STABILIZATION AND CONTROL
Joel B. Fowler, Michael A. Lind, and Edward F. Zalewski Apr. 1979 21 p refs
(PB-295015/2; NBS-TN-987) Avail: NTIS HC A02/MF A01 CSCL 20E

Two simple designs for a low cost laser stabilization system are presented. The systems described are capable of stabilizing the power output of a CW laser line to better than .05% from dc to 100 kHz in the 350 to 1150 nm spectral range. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N79-33467* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CHASSIS UNIT INSERT TIGHTENING-EXTRACT DEVICE Patent
Lester W. Haerther (Collins Radio Co., Cedar Rapids, Iowa) and Paul A. Zimmerman, inventors (to NASA) (Collins Radio Co., Cedar Rapids, Iowa) Issued 3 Mar. 1964 5 p Filed 3 Oct. 1962 Sponsored by NASA
(NASA-Case-XMS-01077-1; US-Patent-3,123,418; US-Patent-Appl-SN-228049; US-Patent-Class-312-319) Avail: US Patent and Trademark Office CSCL 13I

The invention relates to the insertion and extraction of rack mounted electronic units and in particular to a screw thread insert tightening and extract device, for chassis units having a collar which may be rotatably positioned manually for the insert tightening or extraction of various associated chassis units, as desired. Official Gazette of the U.S. Patent and Trademark Office

N79-33468* National Aeronautics and Space Administration, Washington, D. C.
FLOW DIVERTER VALUE AND FLOW DIVERSION METHOD Patent
Samuel B. Arline (United Aircraft Corp., East Hartford, Conn.) and Russell L. Carlson, inventors (to NASA) (United Aircraft Corp., East Hartford, Conn.) Issued 26 May 1964 5 p Filed 4 Aug. 1961 Sponsored by NASA
(NASA-Case-HQN-00573-1; US-Patent-3,134,389; US-Patent-Appl-SN-129379; US-Patent-Class-137-14) Avail: US Patent and Trademark Office CSCL 13I

A flow diverter valve applicable to any fluid flow system requiring rapid bleed or bypass is disclosed. Examples of application of the flow diverter valve to a liquid rocket and a turbojet aircraft engine are given. Features of the valve include: (1) an independent fluid source is used to activate the flow diverter valve toward its closed position during its initial stage of travel; (2) the flow diverter port area and size is unlimited and the valve travel is unlimited; and (3) the valve housing is fabricated such that the valve can be a one step valve, a two step valve, or include as many steps as are found desirable. J.M.S.

N79-33469* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FLUID PRESSURE BALANCED SEAL Patent

Holdridge W. Marsh, inventor (To NASA) (North American Aviation, Inc., Woodland Hills, Calif.) Issued 8 Feb. 1966 7 p Filed 3 Oct. 1961 Sponsored by NASA
(NASA-Case-XGS-01286-1; US-Patent-3,233,862; US-Patent-Appl-SN-142583; US-Patent-Class-251-172) Avail: US Patent and Trademark Office CSCL 11A

A seal which increases in effectiveness with increasing pressure is presented. The seal's functional capability throughout both static and dynamic operation makes it particularly useful for sealing ball valve ports. Other features of the seal include the ability to seal two opposed surfaces simultaneously, tolerance of small misalignments, tolerance of wide temperature ranges, ability to maintain positive sealing contact under conditions of internal or external pressurization, and ability to conform to slight irregularities in seal or surface contours. K.L.

N79-33470 Ohio State Univ., Columbus.
A REAL TIME DIGITAL SYSTEM FOR CONTROL OF A HEXAPOD VEHICLE UTILIZING FORCE FEEDBACK Ph.D. Thesis
Randal Lee Briggs 1979 272 p
Avail: Univ. Microfilms Order No. 7922458

Hardware and software is developed and constructed to demonstrate that it is possible for a legged vehicle to actively adapt to uneven terrain through the use of force feedback. A control scheme incorporating force, rate, and position feedback in a manner which makes a vehicle leg appear actively compliant developed to allow the leg to adapt to uneven terrain and mechanical inaccuracies of the vehicle system is described. The control system is analyzed and a simple first-order model developed to aid in predicting system responses. A variable structure servo control is implemented in addition to the common error-driven scheme which is used exclusively on the OSU Hexapod. A digital data link to connect the Hexapod II to its control computer is presented in detail along with general concepts useful in computer interface design and data link communications. Dissert. Abstr.

N79-33471 Houston Univ., Tex.
SYNTHESIS OF ADJUSTABLE PLANAR FOUR-BAR MECHANISMS Ph.D. Thesis
Anees Ahmad 1979 88 p
Avail: Univ. Microfilms Order No. 7922245

Synthesis techniques for four-bar linkages having adjustable driven crank pivots are outlined for different motion generation problems. For a four-bar linkage, no more than five design positions can be specified. All the possible minimal motion specifications for the two 'phases', consisting of different combinations of the five positions, are enumerated. This leads to four classes of motion generation problems. An analytical solution for the location of the shortest crack for the three and four position synthesis problems is presented. Function generators are designed to generate one or more functions with adjustable link lengths. All these methods of synthesis are analytical in nature, and therefore, well suited for use on a digital computer.
Dissert. Abstr.

N79-33472 Princeton Univ., N. J.
A TWO-DIMENSIONAL MODEL FOR I. C. ENGINE COMBUSTION: INITIAL DEVELOPMENT, TESTING AND APPLICATION Ph.D. Thesis
Harish Chandra Gupta 1979 214 p
Avail: Univ. Microfilms Order No. 7922209

A model for combustion in a divided chamber engine was developed. It consists of a set of zero dimensional ordinary differential equations for the flow between the prechamber and the main chamber before ignition and after completion of combustion. During combustion, a set of unsteady, two dimensional partial differential equations for conservation of mass, momentum, energy and species are solved. The model was applied to the computation of measured flame propagation and pressure in a divided chamber, stratified charge engine operated at different speeds and loads with two prechamber nozzle sizes. Adequate agreement of computed and measured results was obtained. The origin of pressure oscillations unique to divided chamber engines was investigated theoretically with the two dimensional model and with a zero dimensional one. Higher amplitude oscillations were obtained with higher engine speeds. The amplitude of the oscillations also increased with decreasing throat area and increasing prechamber volume, but maxima were reached. Dissert. Abstr.

N79-33473 Wayne State Univ., Detroit, Mich.
GENERAL CORRELATION OF THE IGNITION DELAY PERIOD IN DIESEL ENGINES Ph.D. Thesis
Prem Singh Birdi 1979 239 p
Avail: Univ. Microfilms Order No. 7921640

The ignition delay period was measured in a direct injection diesel engine by the pressure rise method. A gas sampling technique was designed for sampling the preignition reaction products at a predetermined crank angle in the Diesel cycle. The primary reference fuels and their blends, and commercial fuels and their blends, were used for the tests. The mean gas pressure and temperature during the ignition delay period were varied from 250-620 psia and 1267-1964 R, respectively. For the above conditions, the effect of cylinder gas mean temperature on the ignition delay period can be expressed by the inverse form of the Arrhenius relationship, and that the relationship between apparent activation energy of the preignition process and the cetane number of the fuels is nonlinear. Dissert. Abstr.

N79-33474*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
SURFACE TEMPERATURES AND GLASSY STATE INVESTIGATIONS IN TRIBOLOGY
S. Bair and W. O. Winer Jul. 1979 91 p refs
(Grant NsG-3106)
(NASA-CR-162366) Avail: NTIS HC A05/MF A01 CSCL 20K

The limiting shear stress shear rheological model was applied to property measurements pursuant to the use of the constitutive equation and the application of the constitutive equation to elastrohydrodynamic (EHD) traction. Experimental techniques were developed to subject materials to isothermal compression which is similar to the history the materials were subjected to in EHD contacts. In addition, an apparatus was developed for measuring the shear stress-strain behavior of solid lubricating materials. Four commercially available materials were examined under pressure. They exhibit elastic and limiting shear stress behavior similar to that of liquid lubricants. The application of the limiting shear stress model to traction predictions was extended employing the primary materials properties measured in the laboratory. The shear rheological model was also applied to a Grubin-like EHD inlet analysis for predicting film thicknesses when employing the limiting shear stress model material behavior. R.E.S.

N79-33475*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRACTION DRIVE PERFORMANCE PREDICTION FOR THE JOHNSON AND TEVAARWERK TRACTION MODEL
Joseph L. Tevaarwerk Washington Oct. 1979 41 p refs
(NASA-TP-1530; E-033) Avail: NTIS HC A03/MF A01 CSCL 13I

The fluid rheology model is used to investigate the traction behavior for typical traction drive contacts. The aspect ratio of the contact and the invariably present spin are investigated. Contacts with a low aspect ratio predict a superior performance in that they show less slip for the same degree of traction. Spin always has a diminishing effect on the traction at the same slip. At sufficiently high spin the model may be simplified to a limiting shear stress model. The conventional rigid plastic analysis applies here equally well. K.L.

N79-33476*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORRELATION OF ASPERITY CONTACT-TIME FRACTION WITH ELASTOHYDRODYNAMIC FILM THICKNESS IN A 20-MILLIMETER-BORE BALL BEARING
John J. Coy Washington Oct. 1979 21 p refs
(NASA-TP-1547; AVRADCOM-TR-79-26) Avail: NTIS HC A02/MF A01 CSCL 13I

Elastohydrodynamic film thicknesses and asperity contact-time fractions were measured for a 20 mm bore ball bearing by using the capacitance and conductance techniques. The bearing was thrust loaded to 90, 445, and 778 N. The corresponding maximum stresses on the inner race were 1.28, 2.09, and

2.45 GPa. The test speed ranged from 400 to 15,000 rpm. The test bearing was mist lubricated with a MIL-L-23699A turbine oil. The temperature was 27 C. The experimental results were correlated to give the percent film (no-contact-time fraction) as a function of measured film thickness. Measurements were made for three test series that represented the test bearing in various conditions of run-in. The measurements show that the percent film changes with bearing run-in time. The experimental results agreed well with theoretical predictions based on surface trace analysis for a new bearing. For the run-in state, they agreed with previously reported experimental results. The results show that asperity contact existed at a film thickness-roughness ratio lambda of 6.0 or less for a new bearing. After run-in, no asperity contact occurred at a lambda of 3.5 or greater. Author

N79-33477*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NASA GEAR RESEARCH AND ITS PROBABLE EFFECT ON ROTORCRAFT TRANSMISSION DESIGN

Erwin V. Zaretsky, Dennis P. Townsend, and John J. Coy 1979 19 p refs Presented at the Meeting on Helicopter Propulsion Systems, Williamsburg, Va., 6-8 Nov. 1979; sponsored by Am. Helicopter Soc.

(NASA-TM-79292; E-236) Avail: NTIS HC A02/MF A01 CSCL 13I

The results of the NASA gear research is reviewed as well as those programs which are presently being undertaken. Research programs studying pitting fatigue, gear steels and processing, life prediction methods, gear design and dynamics, elastohydrodynamic lubrication, lubrication methods and gear noise are presented. The impact of advanced gear research technology on rotorcraft transmission design is discussed. M.M.M.

N79-33478# FMC Corp., San Jose, Calif. Ordnance Engineering Div.

A VARIABLE FILL FLUID COUPLING FAN DRIVE WITH ELECTRONIC SPEED CONTROL FOR M113A1E1 TEST RIG VEHICLE Final Report, Sep. 1977 - Mar. 1979

Alan M. Loss and Alan J. Samuel 1 Mar. 1979 68 p refs (Contract DAAK30-77-C-0067)

(AD-A070767; FMC-TR-3441; TARADCOM-TR-12441) Avail: NTIS HC A04/MF A01 CSCL 21/7

The work completed under this contract included the design, fabrication, and installation of a Variable Fill Fluid Coupling (VFFC) Fan Drive with Electronic Speed Control into the M113A1E1 Test Rig Vehicle, as well as dynamometer hot room testing of the VFFC in the vehicle. Besides providing the control for modulating fan speed according to coolant temperature, the Electronic Controller (EC) limits the fan speed (overspeed control) to a preset maximum value, regardless of engine speed, and reduces control flow to a preset minimum value during low engine speed operation, regardless of coolant temperature. GRA

N79-33479# Pennsylvania State Univ., University Park. Applied Research Lab.

THE DESIGN AND ANALYSIS OF TURBOMACHINERY IN AN INCOMPRESSIBLE, STEADY FLOW USING THE STREAMLINE CURVATURE METHOD

Mark W. McBride 13 Feb. 1979 183 p refs (Contract N00024-79-C-6043)

(AD-A071107; ARL/PSU-TM-79-33) Avail: NTIS HC A09/MF A01 CSCL 20/4

The design of new and more efficient turbomachinery requires an improved understanding of the fluid flow phenomena associated with the duct and blading required for the operation of such devices. In recent years, the digital computer has made possible the solution of equations of motion pertinent to this field. This study deals with the design and analysis of turbomachinery in an incompressible, steady flow, such as hydraulic pumps and turbines. The basic numerical approach used in the analysis of these devices is the Streamline Curvature Method. Development of a turbomachine design method requires an accurate model of the through-flow describing the spatial variation of the velocity and pressure in the fluid. Equations of motion are developed in a way that allows modeling of the blade row spanwise and chordwise loading distributions on a blade row and determination of their effect on the through-flow. The equations are solved using the Streamline Curvature Method with effects of viscosity and turbulence included in an empirical fashion due to the complexity of the governing equations. Experimental investigations were performed to validate each of the analysis and design methods described. In general, performance of the various test articles was in agreement with predictions. It is apparent, however, that phenomena associated with turbulent and viscous flows require more sophisticated modeling than those used in this study. GRA

N79-33480# Northrop Corp., Hawthorne, Calif. Aircraft Group.

ADVANCED WELDBONDING PROCESS ESTABLISHMENT FOR ALUMINUM Final Report, Nov. 1976 - Oct. 1978

T. R. Croucher Feb. 1979 361 p refs (Contract F33615-76-C-5412)

(AD-A071016; NOR-78-185; AFML-TR-79-4006) Avail: NTIS HC A16/MF A01 CSCL 01/3

This program was conducted to establish the manufacturing parameters necessary to produce structural aircraft fuselage panels by the aluminum weldbonding process. These panels were representative of adhesive bonded panels currently being employed on the USAF/Fairchild Republic A-10. A design, feasibility and trade-off study was conducted by Fairchild, and a representative test panel was designed for comparing the structural performance of weldbond vs. adhesive bonded panels on a 1:1 basis. Northrop Corporation established the manufacturing procedures and process specifications which were used to manufacture the weldbonded panels. Fatigue and damage tolerance tests were conducted to evaluate the effect of different manufacturing variables on fatigue life. These tests showed that weldbonded structures would compare favorably with adhesive bonded structures, and would be significantly superior to riveted structures in low-load transfer fatigue applications. GRA

N79-33481# Naval Research Lab., Washington, D. C.

SOLVENT CLEANING EFFECTS ON MINIATURE BEARING STEEL SURFACES Interim Report, Oct. 1977 - Jan. 1979

Marianne K. Bernett, Barbara J. Kinzig, James S. Murday, and Harold Ravner 14 Jun. 1979 48 p refs

(AD-A070708; NRL-MR-4011) Avail: NTIS HC A04/MF A01 CSCL 13/9

Traces of surface contaminants on precision miniature instrument bearings in guidance and other critical systems and greatly contribute to the ultimate failure of such systems. Current solvent-cleaning procedures employed by Navy facilities to prepare bearings for for assembly vary with respect to materials and methods, but the specific effects of these variations on the bearing surfaces are unknown. To critically examine these effects, reference surfaces of specially cleaned 52100 and 440C bearing steels were characterized at NRL by Auger electron and X-ray photo-electron spectroscopic analysis, and by wettability and infrared studies; they were then subjected to standard sequential cleaning cycles and to individual solvents at several Navy facilities, and re-examined at NRL by the same techniques. The data indicated that various quantities of hydrocarbon, ester, and other residues were deposited during the cleaning process on the reference surfaces. The results are discussed in terms of comparisons of the types, levels, and probable origins of the contaminants, and their implications regarding bearing life and reliability. GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N79-33482 North Carolina State Univ. at Raleigh.

AN EFFICIENT PROCEDURE FOR SELECTING AMONG FIVE RELIABILITY MODELS Ph.D. Thesis

Jacqueline Edwina Aileene Kent 1979 229 p

Avail: Univ. Microfilms Order No. 7923054

A survey of methods used for discriminating among competing families of distributions is given. A technique for selecting the best fitting family of distributions is derived. The technique uses

scale invariant statistics that minimize the probabilities of misclassification and is extended beyond pairwise selections to selecting from a class of families of competing distributions. These statistics are not used in the hypothesis testing framework, but rather as measures of likelihood that the observed data has a distribution from a particular family of probability distributions. The class of families considered are the Uniform, Exponential, Gamma, Weibull, and Lognormal distributions, both for the cases of shape parameters known and unknown. Results of computer simulations are given for pairwise and multiple family selection procedures, showing the misclassification error rates achieved for selected sample sizes. Dissert. Abstr.

N79-33483# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Government Products Div.
STRUCTURAL LIFE PREDICTION AND ANALYSIS TECHNOLOGY Final Report, Oct. 1975 - Nov. 1978
T. A. Cruse and T. G. Meyer Dec. 1978 119 p refs
(Contract F33615-75-C-2063; AF Proj. 3066)
(AD-A070935; PWA-FR-10896; AFAPL-TR-78-106) Avail: NTIS HC A06/MF A01 CSCL 20/11

An improved low cycle fatigue (LCF) life exhaustion method has been developed for gas turbine engine disks subjected to complex mission history loading. The method has been incorporated into a computer program for LCF life exhaustion prediction as a function of component, material, mission history, and mission ordering. Principal advances in LCF life modeling include a simple strain range-mean stress correlation model, a predictive model for the effects of strain hardened surface layers due to machining and the effects of dwell (creep) due to elevated temperature exposure time, a fracture mechanics-based nonlinear, cumulative damage model, a statistical basis for minimum part life prediction, and full-scale component verification. Simplified procedures for nonlinear stress (strain) analysis of notches were developed and calibrated with finite element results. Recommendations for further research emphasize the need for improved constitutive models of cyclic creep/plasticity, a better definition of the effects of various machining operations on material work hardening, as well as residual stresses. Calibrated models for small flaw fracture mechanics would benefit the definition of the cumulative damage algorithm. Finally, the need to control process variability in order to improve part life is emphasized. GRA

N79-33484# Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.
TABLES FOR COMPARING TWO MEAN-TIME-BETWEEN-FAILURES (MTBF s) FOR UNEQUAL TEST TIMES
Robert E. Mioduski Apr. 1979 118 p refs
(DA Proj. 1R7-65706-M-541)
(AD-A070371; AMSAA-TR-226) Avail: NTIS HC A06/MF A01 CSCL 14/4

Tables of critical values for carrying out the exact method of comparing two MTBF's for unequal test times are tabulated for .001, .01, .05, .10, and .20 levels of significance with the ratio of the two test times ranging from 0.1 to 5.0 by increments of 0.1 and the total failures ranging from 1 to 100. The computational formulas for the exact method used on the ARRADCOM CDC Cyber 76 computer located at APG are presented. Examples illustrating the application of these tables are also presented. GRA

N79-33485# Pittsburgh Univ., Pa. Dept. of Mathematics.
MULTIDIMENSIONAL IFRA PROCESSES
Henry W. Block and Thomas H. Savits Mar. 1979 22 p refs
(Contract N00014-76-C-0839; Grant NSF MCS-77-01458)
(AD-A071598; RR-79-01) Avail: NTIS HC A02/MF A01 CSCL 14/4

Two types of multidimensional processes are defined. The first of these generalizes a univariate IFRA process due to Ross and relates to a multivariate concept of IFRA due to Esary and Marshall. The second of these relates to a multivariate concept of IFRA due to the present authors. Decompositions for multistate monotone structure functions are given and behavior of nonincreasing stochastic processes such as those given above is analyzed. Various coherence assumptions for multistate systems are also analyzed. GRA

N79-33486# Battelle Pacific Northwest Labs., Richland, Wash.
DEVELOP THE APPLICATION OF A DIGITAL MEMORY ACOUSTIC EMISSION SYSTEM TO AIRCRAFT FLAW MONITORING
P. H. Hutton and J. R. Skorpik Dec. 1978 74 p refs
(Contract EY-76-C-06-1830; ARPA Order 3476)
(PNL-2873) Avail: NTIS HC A04/MF A01

The use of the acoustic emission (AE) technique to provide a definitive continuous monitor of fatigue crack growth in a critical aircraft structural member was evaluated. A unique AE monitoring system was fabricated and laboratory tested. It utilizes a source isolation feature to distinguish AE originating from an identified area of interest. Two parameters of AE information are recorded on one solid state digital memory for later retrieval and analysis. Installation was made in RAAF Macchi 326 aircraft A7-201 during a major maintenance overhaul. The system is monitoring AE from fatigue cracks in a fastener hole in the tension member of the wing structure center section continuously during flight. Four test flights to evaluate system performance and make necessary adjustments were conducted. DOE

N79-33487# Los Alamos Scientific Lab., N. Mex.
EXPLORATORY COMPARISON OF METHODS FOR COMBINING FAILURE-RATE DATA FROM DIFFERENT DATA SOURCES
H. F. Martz, Jr. and R. A. Waller Nov. 1978 34 p refs
(Contract W-7405-eng-36)
(LA-7556-MS) Avail: NTIS HC A03/MF A01

Thirteen methods are considered for use in pooling failure-rate data from different data sources. A Bayesian approach is taken in which two distinct sources of variation are assumed to be present; namely, prior variation between data sources and statistical error variation within each data source. An exploratory Monte Carlo simulation is used to compare the performance of the methods when used to construct both pooled point and 90% interval estimates of the failure-rate. The results indicated that those methods based on simple averaging techniques are satisfactory when only a small number of data sources are to be pooled. When there are fifteen or more data sets to be pooled, more sophisticated methods, which incorporate additional model structure, are superior. An example is given to illustrate the use of each of the proposed methods. DOE

N79-33488# California Univ., Los Angeles. School of Architecture and Urban Planning.
FACTORS AFFECTING PRODUCT LIFETIME: A STUDY IN SUPPORT OF POLICY DEVELOPMENT FOR WASTE REDUCTION
W. David Conn Aug. 1978 33 p ref
(Grant NSF APR-76-19350)
(PB-295956/7; NSF/RA-780191) Avail: NTIS HC A03/MF A01 CSCL 13B

Factors affecting the lifetime of selected small electrical applicances were examined in order to develop policies to extend these lifetimes (for the purpose of conserving resources, protecting the environment, and reducing the costs of solid waste management). The study included: (1) a consumer survey; (2) indepth interviews with manufacturers; and (3) a limited investigation of second hand markets. It was found that physical durability appears to be a key factor affecting the lifetimes of a few of the products examined (particularly those that malfunction after less than three years' use) while the lifetimes of other products seem more dependent on the consumers' desire for change. Selected policy options are reviewed. GRA

N79-33489# National Technical Information Service, Springfield, Va.
NONDESTRUCTIVE ULTRASONIC TESTING AND INSPECTION, VOLUME 5. CITATIONS FROM THE NTIS DATA BASE Report, May 1977 - May 1979
Guy E. Habercom Jul. 1979 228 p Supersedes NTIS/PS-78/0566; NTIS/PS-77/0402; NTIS/PS-76/0423; NTIS/PS-75/271
(NTIS/PS-79/0635; NTIS/PS-78/0566; NTIS/PS-77/0402; NTIS/PS-76/0423; NTIS/PS-75/271) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

Ultrasonic equipment and techniques for nondestructive inspection/testing of materials and fabrication processes are

investigated in these Government-sponsored research reports. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N79-33490 Rensselaer Polytechnic Inst., Troy, N. Y.
FIELD CONTINUATION: A NEW METHOD OF STRESS ANALYSIS Ph.D. Thesis
Louis Hinman Estabrook 1979 73 p
Avail: Univ. Microfilms Order No. 7922229

The potential of the method of field continuation is demonstrated for the problem of an infinite elastic plate containing equal holes under uniform biaxial tension. Functional equations are derived for two analytic functions and several methods of solving these equations are investigated, including power series expansion and approximate solution by rational functions with suitable poles. The latter method yields a good approximation in simple form. Two and three term approximations yield sufficient accuracy for practical engineering purposes. The results obtained agree with classical solutions for large hole separation and permit extension of these results to closely spaced holes. The solution has engineering applications such as stress analysis of heat exchanger tube sheets and unreinforced nozzles in pressure vessels. It may also permit extension to the associated creep problem. Dissert. Abstr.

N79-33491 Texas Technological Univ., Lubbock.
A FINITE ELEMENT COMPLEMENTARY ENERGY FORMULATION FOR PLANE ELASTOPLASTIC STRESS ANALYSIS Ph.D. Thesis
Muluneh Azene 1979 137 p
Avail: Univ. Microfilms Order No. 7920384

A finite element stress analysis capability for plane elastoplastic problems, employing the principle of stationary complementary energy, is developed. The model consists of an eighteen degree of freedom triangular element. Dissert. Abstr.

N79-33492 Carnegie-Mellon Univ., Pittsburgh, Pa.
DYNAMIC ANALYSIS OF FLEXIBLE PLATES BEARING ON THE ELASTIC HALF-SPACE Ph.D. Thesis
William Lawrence Whittaker 1979 203 p
Avail: Univ. Microfilms Order No. 7919158

The dynamic interaction of an elastic flexural plate and an elastic half-space was analyzed when the system is subjected to harmonic excitation in the form of either external forces or seismic waves. Attention is directed to the displacement responses of rectangular plates and the associated contact pressures that develop on the frictionless contact area for a range of flexural stiffness. Dissert. Abstr.

N79-33493 Ohio State Univ., Columbus.
MODAL RESPONSE OF A CIRCULAR CYLINDRICAL SHELL WITH DAMPING LAYERS Ph.D. Thesis
Krishnan Mahalingam Iyer 1979 117 p
Avail: Univ. Microfilms Order No. 7922503

A set of equations to represent the forced vibrations of a circular cylindrical shell with damping layers is developed using classical thin shell theory. The shell has inside and/or outside layers. The equations are specialized to represent a shell with 'S.D.-S.D.' (shear diaphragm) supports and radial excitation. A method is shown for combining the strain-displacement expressions, the stress resultant expressions and the general equations of motion by making use of matrix algebra. The equations are expressed in a nondimensional form. Computer programs written in Fortran 4 give the modal response of the shell at various frequencies. Numerical results for various combinations of shell parameters (given in graphical and tabular form) are discussed to show the effect of damping layers. Dissert. Abstr.

N79-33494# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TECHNICAL EVALUATION REPORT OF THE SPECIALISTS MEETING ON CHARACTERIZATION OF LOW CYCLE HIGH TEMPERATURE FATIGUE BY THE STRAINRANGE PARTITIONING METHOD
J. M. Drapier (Fabrique Nationale Herstal, Belgium) and M. H. Hirschberg (NASA. Lewis Res. Center) Jul. 1979 14 p refs (AGARD-AR-130; ISBN-92-835-1328-2) Avail: NTIS HC A02/MF A01

The ability of the Strainrange Partitioning Method SRP was evaluated to correlate the creep-fatigue behavior of gas turbine materials and to predict the creep fatigue life of laboratory specimens subjected to complex cycling conditions. A reference body of high temperature creep fatigue data which can be used in the evaluation of other SRP and low cycle high temperature fatigue predictive techniques was provided. M.M.M.

N79-33495# Technische Univ., Berlin (West Germany).
THE INCLUSION OF CRITERIA AND PROCEDURES OF STRUCTURAL FATIGUE STRENGTH ASSESSMENT IN THE DESIGN PROCESS
W. Beitz and R. Haibach 12 Oct. 1978 20 p refs Repr. from Beruecksichtigen der Betriebsfestigkeit im Rahmen des Methodischen Konstruierens. Berichtsband 4. Sitzung des Arbeitskreises Betriebsfestigkeit (Darmstadt), 12 Oct. 1978 p 19-36 In GERMAN; ENGLISH summary
(ICAF-1092) Avail: NTIS HC A02/MF A01

The various procedures suitable for assessing the fatigue strength of structural components have been discussed with reference to the particular stages of the design process. The criteria to be observed in treating the resulting problems may be derived by means of a given guide line, aimed at directing particular attention to the specified requirements of function, safety, fabrication, control, maintenance, etc. As the available input information for making an assessment of the structural behavior will depend on the stage achieved in realizing the design, there is the necessity of making an appropriate selection particular procedure to be applied by taking into account the associated expenditures as well. Author

N79-33496# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
TONGUE-SHAPED CRACK EXTENSION DURING FATIGUE OF HIGH STRENGTH ALUMINUM ALLOYS
J. A. Vlasveld and J. Schijve Apr. 1979 48 p refs
(LR-279; ICAF-1098) Avail: NTIS HC A03/MF A01

Fracture surfaces of both service and laboratory fatigue fractures frequently show dark tongue-shaped marks. In fatigue tests on 7075-T6 specimens such tongues were produced by high peak loads. Measurements indicated that a tongue is not formed during a single burst of crack extension but is the result of a number of successive pop-ins requiring an increasing load. Therefore, tongue formation is a quasi-stable phenomenon. The tunnelling fracture in the center of plate thickness is accompanied by unfailed ligaments at the plate surfaces which reduce the stress intensity at the crack tip. The effect of different material conditions and loading direction on tongue forming was studied. A Dugdale-type model was developed to describe the growth of a tongue. Author

N79-33497# Laboratorium fuer Betriebsfestigkeit, Darmstadt (West Germany). Dept. of Fatigue Analysis of Structures and Components.
LONG LIFE RANDOM FATIGUE BEHAVIOR OF NOTCHED SPECIMENS IN SERVICE, IN SERVICE DUPLICATION TESTS, AND IN PROGRAM TESTS
Ernst Gassner and Wilhelm Lipp 1979 19 p refs Reprinted from Service Fatigue Loads Monitoring, Simulation, and Analysis, ASTM Spec. Tech. Publ. no. 671, 1979 p 222-239
(ICAF-1094) Avail: NTIS HC A02/MF A01

The actual service fatigue life of notched steel and aluminum specimens was determined using a special testing device installed in a passenger car and operated by the vertical displacements of a car rear wheel; the specimens are subjected to reversed bending. The testing device was equipped with counting instrumentation to ensure direct correlation between the individual test result and the relevant frequency distribution of level-

crossings. The results of the service test series are statistically evaluated and presented as stress/life curves for SAE 5140 and for 2024 T 3 specimens. The corresponding stress/life curves, obtained in service duplication tests were not significantly different. However, the conventional eight-step program tests overestimate the fatigue life observed in service and service duplication tests by a factor which may be as high as five. The results of the test series were also compared to fatigue calculations. It was found that the application of a modified linear fatigue damage rule, which does not account for the sequence effect of load changes, yielded fatigue life data which are very much on the nonconservative side. This confirmed the now generally accepted fact that yield fatigue life prediction models must account for the sequence of individual peaks and troughs. Author

N79-33498# Technische Hogeschool, Delft (Netherlands).
PREDICTION METHODS FOR FATIGUE CRACK GROWTH IN AIRCRAFT MATERIAL
J. Schijve Jun. 1979 44 p refs Presented at the 12th Natl. Symp. on Fracture Mech., 21-23 May, St. Louis; sponsored by ASTM
(LR-282; ICAF-1100) Avail: NTIS HC A44/MF A01

A survey is given of relevant knowledge on fatigue crack growth and qualitative and quantitative understanding of predictions. Aspects of cycle-by-cycle predictions and characteristic K prediction methods are discussed. Prediction problems are covered including: (1) crack growth under flight-simulation loading with crack closure measurements; (2) predictions for flight-simulation loading based on a constant crack opening stress level; and (3) crack growth under pure random loading with different s sub rms-values, two irregularities, and two crest factors. Random load tests carried out to explore the usefulness of K sub rms are discussed. J.M.S.

N79-33499*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
CRITERIA FOR REPRESENTING CIRCULAR ARC AND SINE WAVE SPAR WEBS BY NON-CURVED ELEMENTS
Jerald M. Jenkins Oct. 1979 15 p refs
(NASA-TM-72869; H-1106) Avail: NTIS HC A02/MF A01 CSCL 20K

The basic problem of how to simply represent a curved web of a spar in a finite element structural model was addressed. The ratio of flat web to curved web axial deformations and longitudinal rotations were calculated using NASTRAN models. Multiplying factors were developed from these calculations for various web thicknesses. These multiplying factors can be applied directly to the area and moment of inertia inputs of the finite element model. This allows the thermal stress relieving configurations of sine wave and circular arc webs to be simply accounted for in finite element structural models. Author

N79-33500*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LOAD CONCENTRATION DUE TO MISSING MEMBERS IN PLANAR FACES OF A LARGE SPACE TRUSS
Joseph E. Waltz Washington Oct. 1979 39 p refs
(NASA-TP-1522; L-12872) Avail: NTIS HC A03/MF A01 CSCL 20K

A large space structure with members missing was investigated using a finite element analysis. The particular structural configuration was the tetrahedral truss, with attention restricted to one of its planar faces. Initially the finite element model of a complete face was verified by comparing it with known results for some basic loadings. Then an analysis was made of the structure with members near the center removed. Some calculations were made on the influence of the mesh size of a structure containing a hexagonal hole, and an analysis was also made of a structure with a rigid hexagonal insert. In general, load concentration effects in these trusses were significantly lower than classical stress concentration effects in an infinitely wide isotropic plate with a circular rigid inclusion, although larger effects were obtained when a hole extended over several rings of elements. Author

N79-33501# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
COMPUTER TECHNIQUES FOR PLASTICITY
H. Armen and A. Pifko Jun. 1979 50 p refs
(AD-A070810; RM-688J) Avail: NTIS HC A03/MF A01 CSCL 20/11

Implicit in the development of any plasticity model are assumptions associated with the behavior of the actual material. Assumptions generally employed are listed with a discussion of their implications. Several models that incorporate these assumptions or attempt to overcome their restrictions are presented. Several alternative algorithms have evolved and are currently being used in finite element programs for plastic analysis. Each of these has computational advantages and liabilities so that the analyst is presented with choices among acceptable procedures. These procedures are reviewed in order to facilitate a rational selection among competing procedures that best suit the needs of a particular problem class. The contents of this memorandum will appear as a chapter in the ASME Pressure Vessel and Piping Division Vol. I - Decade of Progress in Design and Analysis (1980). GRA

N79-33502# Washington Univ., St. Louis, Mo. Materials Research Lab.
STRESS ANALYSIS AND STRENGTH CHARACTERIZATION OF THICK COMPOSITE LAMINATES Final Report
Edward M. Wu, King Him Lo, and Richard M. Christensen May 1979 119 p refs
(Contract DAAG46-75-C-0096)
(AD-A070951; AMMRC-TR-79-29) Avail: NTIS HC A06/MF A01 CSCL 20/11

This final report covers the theoretical development of and experimental results for the stress analysis and strength characterization of thick composite laminates. Thick composite laminates (consisting of 38 plies or more) are being evaluated for use in future high performance anti-ballistic missiles and other aerospace applications. The theoretical development includes the derivation of a high-order theory of plate deformation which accounts for the effects of transverse shear deformation, transverse normal strain, and a non-linear distribution of the in-plane displacements with respect to the thickness coordinates. The theory is developed for both homogeneous and laminated plates. Further examination of this high-order plate theory via stress solutions which have been carried out to assess its accuracy is reported. This theory, in effect, enables close estimation of three-dimensional stress components from essentially two-dimensional analysis. The effects of the three-dimensional state of stress on the strength of thick laminates are analysed with a 3-D failure criterion. The tensor polynomial method is extended with full account given to three-dimensional stress state effects and is presented together with experiment and evaluation of the coefficients. GRA

N79-33503# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
APPLICATIONS OF GENERALIZED DERIVATIVES TO VISCOELASTICITY Ph.D. Thesis
Ronald L. Bagley Jun. 1979 148 p refs
(AF Proj. 2418)
(AD-A071726; AFIT/DS/AA/79S-2) Avail: NTIS HC A07/MF A01 CSCL 20/11

Generalized derivatives of fractional order are used to construct stress-strain constitutive relations for viscoelastic materials, based on the observed sinusoidal behavior of the materials. The non-periodic behavior of one material is observed in the laboratory and compares favorably with the non-periodic behavior of the material predicted by its generalized derivative constitutive relation. Having established that the generalized derivative constitutive relation is an appropriate mathematical model for the general motion of at least one viscoelastic material, the tools for the analysis of structures of engineering interest are put forward. In particular, attention is focused on a finite element formulation of, and solutions to the equations of motion for structures containing elastic and viscoelastic components. Author (GRA)

N79-33504# McDonnell Aircraft Co., St. Louis, Mo.
ENVIRONMENT LOAD INTERACTION EFFECTS ON CRACK GROWTH Final Report, Jul. 1978 - Aug. 1978
H. D. Dill and C. R. Saff Nov. 1978 224 p refs

(Contract F33615-76-C-3133)
(AD-A071660; AFFDL-TR-78-137) Avail: NTIS HC A10/MF A01 CSCL 11/6

The objective of this program was to systematically investigate chemical environment-load interaction effects on crack propagation. The program was focused by developing a set of design guidelines and criteria for a durability and damage tolerance control plan for landing gear. Current life prediction capability was assessed by comparison of prediction and test. A field survey was conducted to catalog the size, type, and locations of flaws in landing gear components. A crack growth prediction capability developed through analysis and test accounts for environment and load interaction effects. Materials studied are HP-9Ni-4Co-.30 and 300M steels, and 7075-T6 and 7049-T73 aluminums. A flight-by-flight test stress history was developed for a landing gear component, and crack growth predictions prepared. Subsequently, spectrum tests were performed. A Durability/Damage Tolerance Control Plan for landing gear is outlined. GRA

N79-33505# Ohio State Univ. Research Foundation, Columbus.
LARGE AMPLITUDE RESPONSE OF COMPLEX STRUCTURES DUE TO HIGH INTENSITY NOISE Final Report, May - Aug. 1978
Chuh Mei Wright-Patterson AFB, Ohio AFFDL Apr. 1979 42 p refs
(Contract F44620-76-C-0052)
(AD-A071401; AFFDL-TR-79-3028) Avail: NTIS HC A03/MF A01 CSCL 20/11

A problem of interest to the Air Force is the design of acoustically sound aircraft structural components. This is because sonic fatigue failures have resulted in unacceptable maintenance and inspection burdens associated with the operation of the aircraft. In some instances, sonic fatigue failures have resulted in major redesign efforts of structural components. Currently, the sonic fatigue design methods are based upon a combination of experimental and analytical techniques. The analytical methods are based on the linear or small deflection theory (Sonic Fatigue Design Guide for Military Aircraft, AFFDL-TR-74-112, for example). But, on the contrary, the test structural panels respond nonlinearly with large deflections at high intensity acoustic pressure levels. This large amplitude geometrical nonlinearity is the major factor that causes disagreement between the computed and the measured random responses. To improve the analytical design methods, large deflection or nonlinear structure theory must be employed in the analysis. This report presents a review of existing analytical and numerical methods on random excitation on nonlinear multi-degree-of-freedom systems, and an evaluation of these methods based on some realistic considerations from the point of view of their application to complex panel configurations of aircraft structure. GRA

N79-33506# Naval Ship Research and Development Center, Bethesda, Md.
EVALUATION OF SOME CRACK TIP FINITE ELEMENTS FOR ELASTOPLASTIC FRACTURE ANALYSIS
Peter D. Hilton and L. Nash Gifford Jul. 1979 39 p refs
(AD-A071462; DTNSRDC-79/052) Avail: NTIS HC A03/MF A01 CSCL 20/11

Specialized nonlinear crack tip finite elements which include the amplitude of the plastic singular solution as an additional unknown are investigated to determine their capability to directly predict the J-integral for cracked elastoplastic bodies without recourse to numerical evaluation of the J-integral over arbitrarily chosen paths. The special elements are used in conjunction with conventional 12 node quadrilateral isoparametric elements. Power hardening and multilinear representations of the nonlinear stress-strain curve are considered for both deformation and incremental theories of plasticity. GRA

N79-33507# George Washington Univ., Washington, D. C. School of Engineering and Applied Science.
CONSIDERATIONS OF CRACK GROWTH AND PLASTICITY IN FINITE ELEMENT ANALYSIS
James D. Lee and Harold Liebowitz Jul. 1978 42 p refs
(Contract N00014-75-C-0946)
(AD-A071324) Avail: NTIS HC A03/MF A01 CSCL 20/11

A finite element analysis was made of crack growth in a center-cracked specimen subjected to monotonically increasing load until the point of fast fracture. Since part of the specimen experienced unloading, the boundary value problem which was formulated was based upon incremental theory of plasticity. Experimental load and crack-size records were utilized. Linear relations between plastic energy and crack growth were observed. Fracture toughness parameters which were evaluated at the onset of unstable crack propagation, obtained from finite element analysis were in good agreement with those determined experimentally. Author (GRA)

N79-33508# Army Natick Research and Development Command, Mass.
EXPERIMENTAL MEASUREMENT OF STRAIN AND DEFLECTION IN A UNIFORMLY LOADED SIMPLY SUPPORTED COMPOSITE PANEL Final Report, Jan. 1976 - Sep. 1977
Franklin D. Barca Nov. 1978 82 p refs
(DA Proj. 1L7-62723-AH-38; DA Proj. 1L7-62723-A-427)
(AD-A070917; NATICK/TR-79/018) Avail: NTIS HC A05/MF A01 CSCL 13/13

The details of a study to experimentally determine the strain and deflection profile induced in a uniformly loaded, simply supported 1.1-m x 2.3-m aluminum-skin Kraft-paper-honeycomb-core sandwich panel are documented. Twelve panels typical of the type used in military rigid wall tactical shelters were tested at loadings up to 70 kPa. The experimental procedure and apparatus, including a special vacuum chamber constructed to stress the large panels, are described as well as details of the various panels tested. The effects of loading arrangement, strain gage transverse sensitivity and adhesive joint location are addressed. Panel strain and deflection data and core shear data are presented. GRA

N79-33509# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
THE CONSTRAINT METHOD FOR SOLID FINITE ELEMENTS Annual Technical Report, 1 Oct. 1977 - 30 Sep. 1978
I. Norman Katz Sep. 1978 16 p refs
(Grant AF-AFOSR-3122-77; AF Proj. 2304)
(AD-A071022; AFOSR-79-0845TR) Avail: NTIS HC A02/MF A01 CSCL 20/11

In conventional approaches to finite element stress analysis, accuracy is obtained by fixing the degree p of the approximating polynomial and by allowing the maximum diameter h of elements in the triangulation of approach zero. An alternate approach is to fix the triangulation and to increase the degree of approximating polynomials in those elements where more accuracy is necessary to have a family of finite elements of arbitrary polynomial degree p with the property so that as much information as possible can be retained from the pth degree approximation when computing the (p/l) st degree approximation. Comparison of the optimal beam (a variable-section beam) with a reference beam (a constant-section beam) shows that the weight reduction depends strongly on the frequency parameter beta. This weight reduction is negligible for beta = approaching 0, is 11.3 per cent for beta = 1, is 55.3 per cent for beta = 1.4, and approaches 100 per cent for beta approaching 90 degrees. GRA

N79-33510# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
DISCONTINUOUS DEFORMATION GRADIENTS IN PLANE FINITE ELASTOSTATICS OF INCOMPRESSIBLE MATERIALS
Rohan C. Abeyaratne May 1979 79 p refs
(Contract N00014-75-C-0196)
(AD-A071727; TR-41) Avail: NTIS HC A05/MF A01 CSCL 20/11

This investigation is concerned with the possibility of the change of type of the differential equations governing finite plane elastostatics for incompressible elastic materials, and the related issue of the existence of equilibrium fields with discontinuous deformation gradients. Explicit necessary and sufficient conditions on the deformation invariants and the material for the ellipticity of the plane displacement equations of equilibrium are established. The issue of the existence, locally, of 'elastostatic shocks' -- elastostatic fields with continuous displacements and discontinuous deformation gradients -- is then investigated. It is

shown that an elastostatic shock exists only if the governing field equations suffer a loss of ellipticity at some deformation. Conversely, if the governing field equations have lost ellipticity at a given deformation at some point, an elastostatic shock can exist, locally, at that point. The results obtained are valid for an arbitrary homogeneous, isotropic, incompressible, elastic material. GRA

N79-33511# Battelle Columbus Labs., Ohio.
STRESS INDICES FOR GIRTH WELDED JOINTS, INCLUDING RADIAL WELD SHRINKAGE, MISMATCH AND TAPERED-WALL TRANSITIONS
E. C. Rodabaugh and S. E. Moore Sep. 1978 138 p refs
(Contract W-7405-eng-26)
(NUREG-CR-0371; ORNL/Sub-2913/9) Avail: NTIS HC A07/MF A01

A review is presented of B, C and K stress indexes used in the ASME Nuclear Power Plant Code for girth butt welds and girth fillet welds. Theoretical stresses are presented to aid in evaluating C-indexes. Fatigue test data are presented to aid in evaluating K-indexes and CK-products. A limit load theory is presented to aid in evaluating B-indexes. As a result of this review, recommendations are made for changes in the ASME Code. A major part of this consists of presenting definitions for girth welded joints and transitions and appropriate stress indexes for those joints. DOE

N79-33512# European Space Agency, Paris (France).
CALCULATION OF STRESS CONCENTRATIONS IN ELASTOVISCOPLASTICITY
Madeleine Chaudonnert Apr. 1979 144 p refs Transl. into ENGLISH of 'Calcul des Concentrations de Contrainte en Elastoviscoplasticite', ONERA, Paris Report ONERA-P-1978-1, 1978 Original report in FRENCH previously announced as N79-18348
(ESA-TT-547; ONERA-P-1978-1) Avail: NTIS HC A07/MF A01

Stress concentration is studied by means of structural calculations using the integral equation method. Problems related to the discontinuity of the stress vector are resolved by introducing double points, which also permits a coupling of the finite element method with the integral equation calculation method. The integral equation method, developed for the elasticity case, is extended to the elastoviscoplasticity case by means of a process of step by step linearization in time. The proposed method is valid for any constitutive law expressing the rate of viscoplastic strain in terms of the values of the viscoplastic strain, the stress, and one or more implicit parameters. A practical approximation method is developed that allows the time variation of the maximum stress at the bottom of the notch to be predicted in a simple manner. Some examples are given and the results are compared with those obtained by other methods of calculation (finite element method and exact analytic solutions) and by some experimental studies. Author (ESA)

N79-33513# Connecticut Dept. of Transportation, Wethersfield. Bureau of Planning and Research.
ASSESSMENT OF VARIOUS METHODS OF TEST FOR CONCRETE STRENGTH Final Report
David G. Bowers Dec. 1978 48 p refs
(PB-296319/7; FHWA/CT/RD-570-F-78-13) Avail: NTIS HC A03/MF A01 CSCL 13C

Various methods of concrete testing, including flexural strength from beam breaks, compressive strength and splitting tensile strength from cylinders, and penetration resistance from steel probes, were evaluated both under controlled laboratory and partially controlled field conditions. Laboratory results provided good correlation for all methods considered, while the results derived from partially controlled field tests deviated somewhat from confidence bands established on the basis of laboratory data. Penetration-resistance and splitting-tensile tests are recommended as an alternate to beam breaks for concretes with specific constituents for use in determining when forms can be removed from, or loads applied to concrete structures subject to bending stresses. GRA

N79-33514# California Univ., Richmond. Earthquake Engineering Research Center.
THE DEVELOPMENT OF A MATHEMATICAL MODEL TO PREDICT THE FLEXURAL RESPONSE OF REINFORCED CONCRETE BEAMS TO CYCLIC LOADS, USING SYSTEM IDENTIFICATION
John F. Stanton and Hugh D. McNiven Jan. 1979 206 p refs
(Grant NSF ENV-76-04262)
(PB-295875/9; UCB/EEC-79/02; NSF/RA-790056) Avail: NTIS HC A10/MF A01 CSCL 13M

The model is constructed using system identification. The process consists of selecting a form for the model, and then using suitable mathematical techniques to adjust the numerical coefficients within it so that it reproduces as closely as possible the results of experiments. The response of reinforced concrete members to large cyclic loads is nonlinear and inelastic and it changes throughout the history of the load. Because it is so complicated, the physical behavior of the material and mechanics which underlie it are investigated. A model form is then selected which divides the member into hypothetical layers. The material in each layer obeys an appropriate nonlinear constitutive law and the number forces are derived by integration across the cross section. GRA

N79-33515# Pennsylvania State Univ., University Park. Applied Res. Lab.
VIBRATION ISOLATION: USE AND CHARACTERIZATION
John C. Snowdon May 1979 132 p refs
(Contract NBS-6-35746)
(PB-296182/9; NBS/HB-128; LC-79-600062) Avail: NTIS HC A07/MF A01 CSCL 20K

The results of a search and critical evaluation of the literature pertinent to both the use and the characterization of the performance of antivibration mountings for the control of noise and vibration are described. GRA

42 GEOSCIENCES (GENERAL)

N79-33516* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CATALOG OF EARTH PHOTOGRAPHS FROM THE APOLLO-SOYUZ TEST PROJECT
Farouk El-Baz, ed. (Smithsonian Inst., Washington, D. C.) Sep. 1979 295 p ref
(NASA-TM-58218; JSC-14904) Avail: NTIS HC A13 CSCL 05B

Information is given on earth photographs obtained by the Apollo astronauts during the Apollo Soyuz Test Project. The data are arranged in three sections. A map index shows the boundaries of each photograph and is used for a quick survey of the coverage for a given geographical area. A tabular index provides the following data: list of photographs by serial number, description of geographic location, latitude and longitude of the center point of the photograph, date when photograph was taken, ground elapsed time, revolution number of Apollo spacecraft, approximate spacecraft altitude, tilt, sun angle, camera, and lens. The photographic index provides same size black and white prints made from the original color negatives. A.W.H.

N79-33517# Wiggins (J. H.) Co., Redondo Beach, Calif.
NATURAL HAZARDS: A PUBLIC POLICY ASSESSMENT
William J. Petak, Arthur A. Atkisson, and Paul H. Gleye Dec. 1978 541 p refs
(Grants NSF ERS-75-09998; NSF AEN-74-23992)
(PB-297361/8; NSF/PRA-7509998/1) Avail: NTIS HC A23/MF A01 CSCL 13B

The characteristics, geographic distribution, and potential effects of nine hazardous natural events within the United States were studied. The vulnerability of several classes of buildings, and their occupants, to each hazard, the major primary, secondary, and higher order effects expected to be associated with the exposure, by major geographic area, of buildings and their occupants to these hazardous natural events, and the major candidate public problems which are associated with these effects were examined. The costs and characteristics of the major types

of technologies appropriate for mitigating the effects induced by exposure of buildings and their occupants to each of the nine natural hazards and the major types of public policies which may induce the application of hazard-mitigating technologies were assessed. GRA

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N79-33518*# Geological Survey, Denver, Colo. Petrophysics and Remote Sensing Branch.

GEOLOGIC APPLICATIONS OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, 1 Mar. - 31 May 1979

Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson May 1979 6 p Sponsored by NASA ERTS (E79-10279; NASA-CR-162144) Avail: NTIS HC A02/MF A01 CSCL 08B

The author has identified the following significant results. After digitization, a noise rejection filter was applied to data obtained by USGS aircraft. An albedo image was formed by combining three bands of visible data. Along with the day and nighttime thermal data, the albedo image was used to construct a relative thermal-inertia image. This image, registered to a topographic base, shows there are thermal property differences in the vicinity of the contact between the Fort Union and Wasatch formations in the Powder River Basin, Wyoming.

N79-33519*# Pittsburgh Univ., Pa.

MEASUREMENT OF REFLECTIVITIES OF ROCKS, MINERALS AND GLOSSES IN THE VACUUM ULTRAVIOLET

Bruce Hapke, Principal Investigator, William Partlon, Jeffrey K. Wagner, and Alvin J. Cohen 4 Sep. 1979 19 p refs ERTS (Grant NsG-9056)
(E79-10281; NASA-CR-162146) Avail: NTIS HC A02/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N79-33520*# Environmental Research Inst. of Michigan, Ann Arbor.

ANALYSIS OF SCANNER DATA FOR CROP INVENTORIES Progress Report, 7 Mar. - 6 Jun. 1979

Richard C. Cicone, Principal Investigator, E. Crist, Quentin A. Holmes, Richard J. Kauth, P. Lambeck, William A. Malila, W. Pont, and W. Richardson Aug. 1979 155 p EREP
(Contract NAS9-15476)
(E79-10284; NASA-CR-160304; ERIM-132400-24-P) Avail: NTIS HC A08/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N79-33521*# Montana Univ., Missoula.

GRIZZLY BEAR HABITAT ANALYSIS, SECTION 1

John J. Craighead, Gordon B. Scaggs, and Jay S. Sumner, Principal Investigators 1979 190 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS (E79-10288; NASA-CR-162275) Avail: NTIS HC A09/MF A01 CSCL 06C

There are no author-identified significant results in this report.

N79-33522*# Arizona Univ., Tucson. Office of Arid Lands Studies.

APPLIED REMOTE SENSING PROGRAM (ARSP) Annual Report, 1978 - 1979

Jack D. Johnson, Kennith E. Foster, David A. Mouat, Principal investigators, Robert Schowengerdt, Kim Mortensen, Charles Sauerwein, Dean Treadwell, and Arye Topor Aug. 1979 89 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57188 ERTS
(Grant NGL-03-002-313)
(E79-10289; NASA-CR-162281) Avail: NTIS HC A05/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-33523*# California Univ., Berkeley. Space Sciences Lab.

APPLICATION OF REMOTE SENSING TO SELECTED PROBLEMS WITHIN THE STATE OF CALIFORNIA Annual Progress Report

Robert N. Colwell, Andrew S. Benson, John E. Estes, and Leonard W. Bowden, Principal Investigators 1 May 1979 339 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Grant NsG-7220)
(E79-10290; NASA-CR-162282; SSL-Ser-20-Issue-25) Avail: NTIS HC A15/MF A01 CSCL 08F

There are no author-identified significant results in this report.

N79-33524*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.

INTERPRETATION OF REMOTE SENSING DATA IN THE BAYOU LAFOURCHE DELTA OF SOUTH LOUISIANA Final Report, 1 Jun. 1972 - 15 Aug. 1979

C. A. Whitehurst, Principal Investigator Sep. 1979 34 p refs ERTS
(Grant NGL-19-001-105)
(E79-10291; NASA-CR-162285) Avail: NTIS HC A03/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N79-33525*# Centre National d'Etudes Spatiales, Paris (France).

SEA SURFACE TEMPERATURE OF THE COASTAL ZONES OF FRANCE

P. Y. Deschamps (Lille Univ., France), M. Crepon (Museum National d'Histoire Naturelle, France), J. M. Monget (Ecole National Superieure des Mines de Paris), and F. Verger, Principal Investigators (Ecole Normale Superieure, France) Aug. 1979 39 p Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10293; NASA-CR-162324) Avail: NTIS HC A03/MF A01 CSCL 08J

There are no author-identified significant results in this report.

N79-33526*# Bureau de Recherches Geologiques et Minieres, Orleans (France).

SPATIAL THERMAL RADIOMETRY CONTRIBUTION TO THE MASSIF ARMORICAIN AND THE MASSIF CENTRAL (FRANCE) LITHO-STRUCTURAL STUDY Progress Report, Apr. - Aug. 1979

Jean-Yves Scanvic, Principal Investigator Sep. 1979 28 p refs Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(E79-10294; NASA-CR-162325; Rept-1) Avail: NTIS HC A03/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N79-33527*# Environmental Research and Technology, Inc., Concord, Mass.

INVESTIGATION OF THE APPLICATION OF HCMM THERMAL DATA TO SNOW HYDROLOGY Quarterly Progress Report, 1 Jul. - 30 Sep. 1979

James C. Barnes, Principal Investigator 10 Oct. 1979 5 p ERTS
(Contract NAS5-24316)
(E79-10295; NASA-CR-162326; QPR-8) Avail: NTIS HC A02/MF A01 CSCL 08H

There are no author-identified significant results in this report.

N79-33528*# Massachusetts Inst. of Tech., Cambridge.
TECTONIC STRESS: MODELS AND MAGNITUDES
S. C. Solomon, R. M. Richardson (Arizona Univ., Tucson), and E. A. Bergman, Principal Investigators 2 Aug. 1979 32 p refs Presented at USGS Conf. on the Magnitude of Deviatoric Stresses in the Earth's Crust and Upper Mantle, Carmel, Calif., 29 Jul. - 2 Aug. 1979 ERTS
(Grants NsG-7329; NSF EAR-74-21894; NSF EAR-78-12936) (E79-10296; NASA-CR-162327) Avail: NTIS HC A03/MF A01 CSCL 08G

There are no author-identified significant results in this report.

N79-33529*# Environmental Sensing Algorithm Development Co., Sunland, Calif.
EVALUATION AND ANALYSIS OF SEASAT-A SCANNING MULTICHANNEL MICROWAVE RADIOMETER (SMMR) ANTENNA PATTERN CORRECTION (APC) ALGORITHM Final Report
J. L. Kitzis and S. N. Kitzis 28 Sep. 1979 148 p Prepared for JPL
(Contracts NAS7-100; JPL-955368)
(NASA-CR-162346) Avail: NTIS HC A07/MF A01 CSCL 14B

An evaluation of the versions of the SEASAT-A SMMR antenna pattern correction (APC) algorithm is presented. Two efforts are focused upon in the APC evaluation: the intercomparison of the interim, box, cross, and nominal APC modes; and the development of software to facilitate the creation of matched spacecraft and surface truth data sets which are located together in time and space. The problems discovered in earlier versions of the APC, now corrected, are discussed. A.W.H.

N79-33530*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EFFECTS OF VEGETATION CANOPY STRUCTURE ON REMOTELY SENSED CANOPY TEMPERATURES
Daniel S. Kimes Jul. 1979 20 p refs
(NASA-TM-80331) Avail: NTIS HC A02/MF A01 CSCL 08F

The effects of vegetation canopy structure on thermal infrared sensor response must be understood before vegetation surface temperatures of canopies with low percent ground cover can be accurately inferred. The response of a sensor is a function of vegetation geometric structure, the vertical surface temperature distribution of the canopy components, and sensor view angle. Large deviations between the nadir sensor effective radiant temperature (ERT) and vegetation ERT for a soybean canopy were observed throughout the growing season. The nadir sensor ERT of a soybean canopy with 35 percent ground cover deviated from the vegetation ERT by as much as 11 C during the mid-day. These deviations were quantitatively explained as a function of canopy structure and soil temperature. Remote sensing techniques which determine the vegetation canopy temperature(s) from the sensor response need to be studied. A.R.H.

N79-33531*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AN IMPROVED SCHEME FOR THE REMOTE SENSING OF SEA SURFACE TEMPERATURE
G. Dalu (CNR, Ist. di Fisica della Atmosfera, Rome), C. Prabhakara, R. C. Lo (Computer Sci. Corp., Silver Spring, Md.), and M. J. Mack (Computer Sci. Corp., Silver Spring, Md.) Jul. 1979 29 p refs
(NASA-TM-80332) Avail: NTIS HC A03/MF A01 CSCL 08J

A radiometer which possesses two channels in the 11 to 13 micrometer window region is discussed. The radiometer is used to estimate the sea surface temperature within an accuracy of 1 C. A mathematical model is presented to show that the accuracy is improved to within 0.3 C with an independent estimate of total precipitable water vapor. A broadband channel in the 18 micrometer water vapor band is introduced in addition to the two former channels to remotely sense the total precipitable water vapor. The effect of the surface emissivity is taken into account in the scheme. A.W.H.

N79-33532# Purdue Univ., Lafayette, Ind. School of Electrical Engineering.
IMPROVEMENTS IN SOME IMAGE COMPRESSION TECHNIQUES FOR AERIAL RECONNAISSANCE ANALYSIS Final Technical Report, 1 Jul. - 30 Sep. 1978
O. R. Mitchell, S. C. Bass, E. J. Delp, T. W. Goeddel, and A. Tabatabai May 1979 102 p refs
(Contract F30602-78-C-0102; AF Proj. 2305)
(AD-A071088; RADC-TR-79-99) Avail: NTIS HC A06/MF A01 CSCL 09/4

In this study a number of image coding methods were implemented and applied to aerial reconnaissance photos for relative ranking evaluations by experienced photo-analysts. These coding methods were of three broad types: two-dimensional transform, one-dimensional hybrid, and spatial. The compression rates used were 1.6 and 0.5 bits/pixel. The effects of channel errors at a .001 error rate were also simulated and evaluated. GRA

N79-33533# Colorado State Univ., Fort Collins. Coll. of Forestry and Natural Resources.
TERRAIN FEATURE CANOPY MODELING Final Report
D. S. Kimes, James A. Smith, and K. J. Ranson 30 Apr. 1979 194 p
(Contract DACW39-77-C-0073; Grants DAAG29-78-G-0045; DAAG29-76-G-0105)
(AD-A071793; ARO-13444.2) Avail: NTIS HC A09/MF A01 CSCL 02/6

A thermal canopy signature model (TCSM) was developed to approximate the thermal behavior of a vegetation canopy by a mathematical abstraction of three horizontal layers of vegetation. Canopy geometry within each layer is quantitatively described by the foliage and branch orientation distributions. Canopy geometry, solar irradiance, air temperature, horizontal wind velocity, relative humidity, and ground temperature are used to calculate the energy budgets of average leaves within each layer. The resulting system of conservation equations is solved for the average layer temperature. This information, together with the angular distributions of radiating elements, is then used to calculate the thermal existance as a function of view angle above the canopy. Optical diffraction techniques were developed and employed to measure canopy geometry. Solar radiation absorption with the vegetation terrain elements is calculated using a modification of a Monte Carlo model (SRVC) developed for the reflective energy regime. The models were applied to a lodgepole pine (Pinus contorta) canopy and the results for a diurnal cycle are validated with radiometric measurements. Simulated versus measured radiometric average temperatures of Layer 2 correspond approximately within two degrees centigrade. Simulated results suggest that canopy geometry can significantly influence the effective radiant temperature recorded by a sensor above the canopy as a function of view angle. GRA

N79-33534# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
SNOWPACK OPTICAL PROPERTIES IN THE INFRARED
Roger H. Berger May 1979 16 p refs
(DA Proj. 4A7-62730-AT-42)
(AD-A071004; CRREL-79-11) Avail: NTIS HC A02/MF A01 CSCL 08/12

A theory of the optical properties of snow in the 2-20 microns region of the infrared has been developed. Using this theory it is possible to predict the absorption and scattering coefficients and the emissivity of snow, as a function of the snow parameters of grain size and density, for densities between 0.17 and 0.4 g/cu. cm. The absorption and scattering coefficients are linearly related to the density and inversely related to the average grain size. The emissivity is independent of grain size and exhibits only a weak dependence upon density. GRA

N79-33535# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
A LANDSAT DATA COLLECTION PLATFORM AT DEVIL CANYON SITE, UPPER SUSITNA BASIN, ALASKA. PERFORMANCE AND ANALYSIS OF DATA
Richard K. Haugen, Ray L. Tuinstra, and Charles W. Slaughter Feb. 1979 20 p refs
(AD-A068508; CRREL-SR-79-2)' Avail: NTIS HC A02/MF A01 CSCL 13/2

In October 1974, a LANDSAT Data Collection Platform was

installed near the prospective Devil Canyon damsite on the Susitna River, south central Alaska. The development of sensor interfaces and characteristics of transmitted data for air and ground surface temperature, windspeed and wind run, water equivalent snow accumulation, and battery voltage are discussed. Temperature data are analyzed statistically and compared with data from surrounding National Weather Service stations. Although some difficulties were encountered in operation during the winter of 1974-75, it was demonstrated that the LANDSAT data collection system could provide useful environmental data from a remote, subarctic location in the winter on a near-real-time basis. GRA

N79-33536# Hawaii Univ., Honolulu. Pacific Urban Studies and Planning Program.
NOTES ON HAWAIIAN SAND BEACH MANAGEMENT: TECHNICAL SUPPLEMENT NO. 12. HAWAII COASTAL ZONE MANAGEMENT PROGRAM
Doak C. Cox Sep. 1978 30 p Sponsored in part by State of Hawaii Dept. of Planning and Economic Development
(Grant NOAA-04-7-158-44135)
(PB-296714/9; NOAA-79050808) Avail: NTIS HC A03/MF A01 CSCL 13B

Issues associated with the management of sand beaches in the State of Hawaii are addressed. Beach processes, artificial sand removal, land use, and public management of beaches and beach-front lands are examined. GRA

N79-33537# Regional Planning Council, Baltimore, Md.
LAND USE IN THE BALTIMORE REGION, 1976
Leonard H. Fink Nov. 1978 87 p Sponsored in part by HUD
(PB-297105/9; BTL-RPC-78-009) Avail: NTIS HC A05/MF A01 CSCL 13B

The Regional Planning Council land use inventory was updated from 1973 to 1976. The maps and data describing existing land use are used as baseline land use information in the regional planning process. Topics covered include land use data by various use classifications and by jurisdiction and Regional Planning Districts. The method used to update the inventory is described. GRA

N79-33538# Denver Research Inst., Colo.
EPA PROGRAM STATUS REPORT: OIL SHALE, 1979 UPDATE
R. E. Pressey and P. A. Westcott Mar. 1979 71 p refs
(Contract EPA-R-806156)
(PB-294998/0; EPA-600/7-79-089) Avail: NTIS HC A04/MF A01 CSCL 08I

EPA studies related to the development and commercialization of oil shale are providing information on health and ecological effects from pollutants created by the extraction and processing of oil shale, and on technological methods that can be used to control the release of those pollutants. The program is also assessing the environmental impact of the use of the fuels refined from shale oil. The reader with an overview of current oil shale research and development (R and D) efforts being performed by EPA, or being funded by EPA monies passed through to other Federal agencies under the five-year old 17 agency Interagency Energy Environment R and D Program. It covers extraction and handling, processing, energy-related processes and effects, and overall assessments. Project title, sponsoring agency, performing organization, project duration, and project contact are given. GRA

N79-33539# Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
FINITE ELEMENT ANALYSIS OF THREE-DIMENSIONAL WIND-DRIVEN FREE SURFACE FLOWS M.S. Thesis
Charles T. Kincaid 1979 268 p refs
(Contract DI-14-34-0001-7191)
(PB-296726/2; W79-07165; OWRT-B-139-UTAH(4)) Avail: NTIS HC A12/MF A01 CSCL 08H

Part of a more comprehensive study of the circulation of Great Salt Lake is presented. The development and application of a three-dimensional steady-state model of lake circulation are reported. The primary scope involves the development of a mathematical-numerical model of steady-state wind-induced circulation. Specific inflow and outflow are handled as well. Driving forces included wind-induced shear, free surface set-up, bottom shear, and Coriolis. An uncoupled solution of the Navier-Stokes equations for velocity and a Poisson's equation for pressure is presented. The assumption of hydrostatic pressure reduced the pressure variable to one of free surface elevation. GRA

N79-33540# Connecticut Univ., Storrs. Inst. of Water Resources.
PROCEEDINGS: LAKE MANAGEMENT CONFERENCE
Mar. 1979 131 p refs Conf. held at Storrs, Conn., 9 Jun. 1977
(Contract DI-14-34-0001-9007)
(PB-296093/8; W79-06893; OWRT-A-999-CONN(18)) Avail: NTIS HC A07/MF A01 CSCL 08H

Eight technical papers on various aspects of lake management were presented at the Lake Management Conference. The results of research on the various suspected causes of lake eutrophication, the relationship of land use to lake water quality, the ongoing lake management strategies and the plans suggested for future approaches were explained. The effectiveness of various eutrophication control methods were discussed and the costs to be expected for the use of these methods were given. Emphasis was placed on the management of Connecticut lakes, although studies on lakes throughout the state and the nation were also mentioned. GRA

N79-33541# Minnesota Univ., St. Paul. Water Resources Research Center.
EFFECTS OF DRAINAGE PROJECTS ON SURFACE RUNOFF FROM SMALL DEPRESSIONAL WATERSHEDS IN THE NORTH CENTRAL REGION
Ian D. Moore and Curtis L. Larson Jan. 1979 239 p refs
(Contract DI-14-31-0001-6092)
(PB-295796/7; WRRC-Bull-99; W79-06729; OWRT-B-122-MINN(1)) Avail: NTIS HC A11/MF A01 CSCL 08H

Surface runoff from small watersheds characterized by numerous depressions was studied statistically and by use of a special purpose watershed model. The statistical analyses illustrated the possible magnitude of the storage effect exhibited by lakes, marshes and other depressions. Because of data limitations statistical techniques could not be used to examine the effects on flood runoff of draining these same areas. The model represents the processes of snowmelt, infiltration, soil moisture storage, evapotranspiration, subsurface and surface runoff for four different land drainage conditions, with or without channel development. Application of the model to two small watersheds in Jackson County, Minnesota indicated that drainage development increases annual runoff, storm runoff and peak discharge. GRA

N79-33542# American Planning Association, Chicago, Ill. Planning Advisory Service.
COMPUTER-ASSISTED LAND RESOURCES PLANNING
Devon M. Schneider and Syed Amanullah Jan. 1979 53 p refs
(Contract DI-14-08-001-15972)
(PB-296975/6) Avail: NTIS HC A04/MF A01 CSCL 08B

The use of computerized geographic information systems in planning is described, questions to be asked of agencies and/or of consultants, and the important management issues involved are identified. GRA

N79-33543# Case Western Reserve Univ., Cleveland, Ohio.
THE ROLE OF THE NATIONAL SCIENCE FOUNDATION IN ARID AND SEMI-ARID LAND RESEARCH
Yacov Y. Haimes 19 Feb. 1979 107 p refs Workshop held at Washington, D. C., 11-12 Dec. 1978
(Grant NSF 79-SP-0399)
(PB-294930/3; NSF/RA-790021) Avail: NTIS HC A06/MF A01 CSCL 13B

Issues stressing priorities particularly relevant to current problems in arid and semi-arid regions are presented. The priorities ranked in descending order include: (1) creation within NSF of an office of arid and semi-arid lands research; (2) research responsive to scientific and technological criteria; (3) risk and impacts analysis; (4) ground water; (5) water supply and demand; (6) multiobjective-multiattribute analysis; (7) agriculture and land use; (8) climate and weather modification; (9) Indian concerns;

(10) energy issues; and (11) methodologies for planning and management. GRA

N79-33544# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
UPPER ST. LAWRENCE RIVER HYDRAULIC TRANSIENT MODEL
Alan J. Potok Oct. 1978 104 p refs
(PB-297490/5; NOAA-TM-ERL-GLERL-24; NOAA-79051002) Avail: NTIS HC A06/MF A01 CSCL 13B

A hydraulic transient model of the upper St. Lawerence River, is designed to simulate river profiles and flows on the St. Lawrence River from Lake Ontario to the Moses-Saunders powerhouse near Massena, NY. It is capable of simulation on varying time increments and includes flow under ice-covered, as well as open-water conditions. The mathematical model, its development, calibration, verification, and typical applications are described. GRA

N79-33545# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
ICE THICKNESS AND STRATIGRAPHY AT NEARSHORE LOCATIONS ON THE GREAT LAKES (METRIC UNITS)
Frederick E. Sleator Jul. 1978 443 p ref
(PB-297121/6; NOAA-79060401; NOAA-DR-ERL-GLERL-1-2; GLERL-Contrib-167) Avail: NTIS HC A19/MF A01 CSCL 08L

Data collected under a program instituted by the U. S. Lake Survey during winter 1965-66 and currently under the Great Lakes Environmental Research Laboratory is reported. The data collection network is documented and the data collection and editing procedures are described. Edited data are presented in metric units. A version of this report using standard (English) units is available. GRA

N79-33546# Utah Water Research Lab., Logan.
ESTIMATION OF WATER SURFACE ELEVATION PROBABILITIES AND ASSOCIATED DAMAGES FOR THE GREAT SALT LAKE
L. Douglas James, David S. Bowles, W. Robert James, and Ronald V. Canfield Mar. 1979 194 p refs
(Contract DI-14-34-0001-8122)
(PB-296056/5; UWRL-P-79/03; W79-06894; OWRT-B-153-UTAH(2)) Avail: NTIS HC A09/MF A01 CSCL 08H

Methods of operational hydrology were used to simulate lake level and shoreline damage sequences for the Great Salt Lake. Both ARMA (1,0) and ARMA (1,1) models were tried in generating multivariate sequences of precipitation, evaporation, and three river flows for 1937-1977. The multivariate Markov model was the only one able to preserve historical sequences, but recommendations for improved parameter solution techniques for the ARMA (1,1) model are made to help future users take better advantage of its theoretically greater ability to preserve hydrologic persistence. GRA

N79-33547# National Geodetic Survey, Rockville, Md.
DETERMINATION OF NORTH AMERICAN DATUM 1983 COORDINATES OF MAP CORNERS (SECOND PREDICTION)
T. Vincenty Apr. 1979 12 p refs
(PB-297245/3; NOAA-TM-NOS-NGS-16; NOAA-79052402) Avail: NTIS HC A02/MF A01 CSCL 08B

A previous publication gave the predicted changes in coordinates of map corners which will occur after the 1983 readjustment of the North America geodetic networks is accomplished. These predictions are now revised on the basis of new data. Recent investigations of Doppler scale and orientation involved comparisons of Doppler data with results obtained by radio-interferometric surveying (known as VLBI) and by astronomic methods. They indicate that corrections should be applied to Doppler NWL9D data. GRA

N79-33548# Resources for the Future, Inc., Washington, D. C.
MANAGEMENT OF ARID LANDS: AN AGENDA FOR RESEARCH
Helen Ingram, Rosemary Nichols, Anne Gault, and Patricia Rosenfield 1978 68 p refs Sponsored by NSF
(PB-296222/3; NSF/RA-780567) Avail: NTIS HC A04/MF A01 CSCL 08H

The characteristics of arid lands, arid lands under stress, and issues in arid lands policy are considered. The inherent environmental variability of arid lands and the modes of adaptation evolved by arid lands peoples are discussed. Forces effecting rapid change in arid lands, including economic integration and demographic change are reviewed. Dealing with arid lands issues is made more difficult because of a lack of specific focus upon arid lands in public policy and the lack of sufficient arid lands policy research. Ten research recommendations are presented. GRA

N79-33549# Golder Associates, Inc., Kirkland, Wash.
OIL MINING: A TECHNICAL AND ECONOMIC FEASIBILITY STUDY OF OIL PRODUCTION BY MINING METHODS Open File Report, Apr. 1977 - Jul. 1978
Anthony Edey, Bruce A. Kennedy, and Leigh A. Readdy Oct. 1978 293 p refs
(Contract DI-BM-JO-275018)
(PB-297134/9; BM-OFR-55-79) Avail: NTIS HC A13/MF A01 CSCL 08I

The characteristics of oil fields which would make them amenable to mining techniques were identified. An inventory of known U.S. oil fields that offer this potential was collated. Data was then divided into fields having potential for underground and surface mining systems development. Several candidate fields in Arkansas, California, and Utah that fit particular underground and surface mining system types were selected. Conceptual mining systems were designed for the selected fields. Five underground and four surface methods were chosen. Costs of oil production were estimated for these selections. The impact of oil mining on the environment was also considered. GRA

N79-33550# Massachusetts Univ., Amherst. Water Resources Research Center.
DEVELOPMENT OF A MODIFIED TRACER TECHNIQUE FOR MEASURING THE STREAM REAERATION RATE
Joseph Michael Kwasnik and Tsuan Hua Feng Feb. 1979 82 p refs
(Contract DI-14-34-0001-8023; OWRT Proj. A-088-MASS(1))
(PB-296317/1; PUB-102; W79-06915) Avail: NTIS HC A05/MF A01 CSCL 08H

The modified tracer technique of K2 measurement uses a hydrocarbon tracer, ethylene, and a conservative tracer, Rhodamine- WT dye. Laboratory experiments determined the parameters essential to the successful field use of the technique. Initial field testing was begun on a channelized section of the Mill River in Northampton, MA. Two runs were conducted to verify the reproducibility and precision of the technique. Additional tests were run on the North River in Colrain, Massachusetts. The results of the field testing indicate that the modified tracer technique is a precise and accurate means of directly measuring the reaeration rate, K2. GRA

N79-33551# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Great Lakes Environmental Research Lab.
SURFACE WAVE DATA RECORDED IN LAKE MICHIGAN DURING 1973 AND 1975-1977
Blondell C. Doughty, Timothy A. Kessernich, and Paul C. Liu Oct. 1978 9 p ref
(PB-297296/6; NOAA-79051601; NOAA-DR-ERL-GLERL-19; GLERL-Contrib-155) Avail: NTIS HC A02/MF A01 CSCL 08H

Surface wave data recorded by waverider buoys deployed in Lake Michigan during 1973, 1975, 1976, and 1977 are presented. Latitude, longitude, and depth of the buoy locations are listed. The data were continuously recorded on analog magnetic tapes and processed through a computer digitization and analysis system that includes manual editing, calibration, time correlation, analysis, and data summary generation. GRA

N79-33552# TRW Energy Systems, Redondo Beach, Calif.
TECHNOLOGY OVERVIEW REPORTS FOR EIGHT SHALE OIL RECOVERY PROCESSES
C. C. Shih, J. E. Cotter, C. H. Prien, and T. D. Nevens Mar. 1979 115 p refs Prepared in cooperation with Denver Research Inst., Colo.

(Contract EPA-68-02-1881)
(PB-295665/4; EPA-600/7-79-075) Avail: NTIS HC A06/MF A01 CSCL 08I

Information for the evaluation of environmental impacts and pollution control technologies in connection with oil shale development is presented. General process descriptions, shale preparation requirements, equipment types, operating conditions, and process products and byproducts are reported. The physical and chemical characteristics of shale oil recovery, the energy and water requirements, the waste disposal, and site specific environmental aspects are examined. A.W.H.

N79-33553# California Univ., Riverside. Institute of Geophysics and Planetary Physics.
TELLURIC SOUNDING AND MAPPING IN THE VICINITY OF THE SALTON SEA GEOTHERMAL AREA, IMPERIAL VALLEY, CALIFORNIA M.S. Thesis
Eugene Drake Humphreys Jun. 1978 127 p refs
(Grant NSF AER-72-03551)
(PB-296081/3; UCR/IGPP-78/17; NSF/RA-780510) Avail: NTIS HC A07/MF A01 CSCL 08I

A geophysical survey conducted in the region of the Salton Sea geothermal fields is discussed. Telluric sounding was utilized to determine the subsurface resistivity structure in order to indicate resistivity to a great depth. A wide span of frequencies were used in order to determine the electrical properties with depth. The correlation of high rock temperature and low resistivity is discussed and the Jacobian of the transformation matrix is calculated. Mappings of the resistivity of the area are presented. A.W.H.

N79-33554# Office of Technology Assessment, Washington, D. C.
MANAGEMENT OF FUEL AND NONFUEL MINERALS IN FEDERAL LAND: CURRENT STATUS AND ISSUES
Apr. 1979 444 p
(PB-295788/4; OTA-M-88) Avail: NTIS HC A19/MF A01 CSCL 05A

The land management and disposal laws, policies, and practices that affect mineral exploration, development, and production on Federal onshore lands are analyzed. The discovery and production of minerals, including onsite processing and removal of the minerals from the mine site, and the effects on air, land, and water are discussed. The establishment of a mineral land management system that will identify and develop mineral resources in an environmentally safe manner is proposed.A.W.H.

N79-33555# Joint Publications Research Service, Arlington, Va.
BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 118
5 Sep. 1979 69 p refs Transl. into ENGLISH from various Russian articles
(JPRS-74132) Avail: NTIS HC A04/MF A01

Agrotechnology, epidemiology, industrial microbiology, plant pathology, and public health are among the topics covered. Remote sensing and ecological considerations are included. For individual titles, see N79-33556 through N79-33556.

N79-33556# Joint Publications Research Service, Arlington, Va.
REMOTE SENSING PHENOLOGY IN GEOBOTANY
B. V. Vinogradov *In its* Biomed. and Behavioral Sci., No. 118 (JPRS-74132) 5 Sep. 1979 p 1-23 refs Transl. into ENGLISH from Botan. Zh. (Leningrad), 64, no. 6, 1979 p 805-819 (For primary document see N79-33555 24-43)
Avail: NTIS HC A04/MF A01

Remote sensing phenology, a method for studying the seasonal rhythm of vegetation and ecological conditions by means of a comparison of aerial and space photographs taken at different seasons over one and the same territory under comparable atmospheric and optical survey conditions, is considered. The different technology of phenooptical measurements makes it possible to study phenological changes at points, along profiles, and over mapped areas. Automatic methods for the detection of changes and comparison of phenooptical maps are included. J.M.S.

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N79-33557 Clark Univ., Worcester, Mass.
SHELTER DESIGN AND ENERGY USAGE: A METHODOLOGY FOR EVALUATING THE IMPACTS OF RESIDENTIAL SPACE CONDITIONING TECHNOLOGIES ON THE CONSUMER, THE ELECTRIC UTILITY, AND SOCIETY Ph.D. Thesis
Robert M. Wirtshafter 1979 242 p
Avail: Univ. Microfilms Order No. 7923167

A 'total systems' methodology was developed to examine technologies for residential space conditioning including active and passive solar energy, building design, and energy conservation. Assessment of each technology include measurement of cost effectiveness for the homeowner, impact on electric utility loads and finances, and societal benefits. Trade-offs between technologies and preferred public policy options were identified for the case study of Colorado Springs, Colorado. Dissert. Abstr.

N79-33558 Carnegie-Mellon Univ., Pittsburgh, Pa.
STUDIES OF AlGaAs-GaAs SOLAR CELLS Ph.D. Thesis
Ariel Flat 1979 157 p
Avail: Univ. Microfilms Order No. 7919142

The operation of AlGaAs-GaAs solar cells are described. The interpretation of minority carrier diffusion length measurements by electron beam induced measurements and the development of contact grid patterns in concentration applications are discussed. Liquid phase epitaxy processing and diffusion studied of Zn in GaAs are considered. Dissert. Abstr.

N79-33559*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
HIGH TEMPERATURE - LOW MASS SOLAR BLANKET Final Report
H. G. Mesch Aug. 1979 121 p refs Prepared for JPL
(Contract NAS7-100; JPL-955139)
(NASA-CR-162334; TRW-32809.000) Avail: NTIS HC A06/MF A01 CSCL 10A

Interconnect materials and designs for use with ultrathin silicon solar cells are discussed, as well as the results of an investigation of the applicability of parallel-gap resistance welding for interconnecting these cells. Data relating contact pull strength and cell electrical degradation to variations in welding parameters such as time, voltage and pressure are presented. Methods for bonding ultrathin cells to flexible substances and for bonding thin (75 micrometers) covers to these cells are described. Also, factors influencing fabrication yield and approaches for increasing yield are discussed. The results of vacuum thermal cycling and thermal soak tests on prototype ultrathin cell test coupons and one solar module blanket are presented. R.E.S.

N79-33560*# General Electric Co., Schenectady, N. Y.
CONCEPTUAL DESIGN OF THERMAL ENERGY STORAGE SYSTEMS FOR NEAR TERM ELECTRIC UTILITY APPLICATIONS Final Report
E. W. Hall, W. Hausz, R. Anand, N. LaMarche, J. Oplinger, and M. Katzer Jul. 1979 359 p refs Sponsored by NASA Prepared for DOE
(Contracts DEN3-12; EC-77-A-31-1034-2; EPRI Proj. RP1082-1)
(NASA-CR-159577; GE79ET0101; DOE/NASA/0012-79/2)
Avail: NTIS HC A16/MF A01 CSCL 10B

Potential concepts for near term electric utility applications were identified. The most promising ones for conceptual design were evaluated for their economic feasibility and cost benefits. The screening process resulted in selecting two coal-fired and two nuclear plants for detailed conceptual design. The coal

plants utilized peaking turbines and the nuclear plants varied the feedwater extraction to change power output. It was shown that the performance and costs of even the best of these systems could not compete in near term utility applications with cycling coal plants and typical gas turbines available for peaking power. Lower electricity costs, greater flexibility of operation, and other benefits can be provided by cycling coal plants for greater than 1500 hours of peaking or by gas turbines for less than 1500 hours if oil is available and its cost does not increase significantly.
R.E.S.

N79-33561*# Wyle Labs., Inc., Huntsville, Ala.
INDOOR TEST FOR THERMAL PERFORMANCE OF THE SUNMASTER EVACUATED TUBE (LIQUID) SOLAR COLLECTOR
Sep. 1979 40 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161306; WYLE-TR-531-30R) Avail: NTIS HC A03/MF A01 CSCL 10A

The test procedures used to obtain the thermal performance data for a solar collector under simulated conditions are presented. Tests included a stagnation test, a time constant test, a thermal efficiency test, an incident angle modifier test, and a hot fill test. All tests were performed at ambient conditions and the transient effect and the incident angle effect on the collector were determined. The solar collector is a water working fluid type.
A.W.H.

N79-33562*# Spectrolab, Inc., Sylmar, Calif.
INVESTIGATION OF PROPOSED PROCESS SEQUENCE FOR THE ARRAY AUTOMATED ASSEMBLY TASK, PHASE 2 Quarterly Technical Progress Report, period ending 30 Jun. 1979
Nick Mardesich, Alec Garcia, Steve Bunyan, and Angel Pepe Jul. 1979 59 p refs Sponsored by NASA Prepared for JPL and DOE
(Contract JPL-954853)
(NASA-CR-162364; DOE/JPL-954853-79/3) Avail: NTIS HC A04/MF A01 CSCL 10A

The technological readiness of the proposed process sequence was reviewed. Process steps evaluated include: (1) plasma etching to establish a standard surface; (2) forming junctions by diffusion from an N-type polymeric spray-on source; (3) forming a p+ back contact by firing a screen printed aluminum paste; (4) forming screen printed front contacts after cleaning the back aluminum and removing the diffusion oxide; (5) cleaning the junction by a laser scribe operation; (6) forming an antireflection coating by baking a polymeric spray-on film; (7) ultrasonically tin padding the cells; and (8) assembling cell strings into solar circuits using ethylene vinyl acetate as an encapsulant and laminating medium.
K.L.

N79-33563*# Solarex Corp., Rockville, Md.
ANALYSIS OF THE EFFECTS OF IMPURITIES IN SILICON Quarterly Report, 1 May - 31 Jul. 1979
J. H. Wohlgemuth, W. M. Lafky, and J. H. Burkholder 31 Jul. 1979 44 p refs Sponsored by NASA Prepared for JPL and DOE
(Contract JPL-955307)
(NASA-CR-162350; DOE/JPL-955307-79/2) Avail: NTIS HC A03/MF A01 CSCL 10A

A solar cell fabrication and analysis program to determine the effects on the resultant solar cell efficiency of impurities incorporated into silicon is conducted. Flight quality technologies and quality assurance are employed to assure that variations in cell performance are due to the impurities incorporated in the silicon. The type and level of impurity doping in each test lot is given and the mechanism responsible for the degradation of cell performance is identified and correlated to the doped impurities.
A.W.H.

N79-33564*# Spire Corp., Bedford, Mass.
INTEGRAL GLASS ENCAPSULATION FOR SOLAR ARRAYS Quarterly Progress Report
Jun. 1979 18 p Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-954521)
(NASA-CR-162361; DOE/JPL-954521-79/2; QPR-10) Avail: NTIS HC A02/MF A01 CSCL 10A

Progress in the development of permanent, integral glass encapsulation of terrestrial solar photovoltaic arrays by electrostatic bonding is reported. Two basic types of electrostatically bonded modules were demonstrated and their reliability proven in accelerated environmental testing. Economic analyses indicate that electrostatic bonding can be a cost effective, practical, and automatable process for large-scale production of arrays with lifetimes of more than 20 years.
J.M.S.

N79-33565*# Lamar Univ., Beaumont, Tex. Dept. of Chemical Engineering.
PROCESS FEASIBILITY STUDY IN SUPPORT OF SILICON MATERIAL TASK 1 Quarterly Technical Progress Report, Jun. - Aug. 1979
Ku-Yen Li, Keith C. Hansen, and Carl L. Yaws Sep. 1979 45 p refs Sponsored by NASA Prepared for JPL and DOE
(Contract JPL-954343)
(NASA-CR-162354; QTPR-16; DOE/JPL-954343-79/16) Avail: NTIS HC A03/MF A01 CSCL 10A

Analysis of process system properties was continued for silicon source materials under consideration for producing silicon. The following property data are reported for dichlorosilane which is involved in processing operations for silicon: critical constants, vapor pressure, heat of vaporization, heat capacity, density, surface tension, thermal conductivity, heat of formation and Gibb's free energy of formation. The properties are reported as a function of temperature to permit rapid engineering usage. The preliminary economic analysis of the process is described. Cost analysis results for the process (case A-two deposition reactors and six electrolysis cells) are presented based on a preliminary process design of a plant to produce 1,000 metric tons/year of silicon. Fixed capital investment estimate for the plant is $12.47 million (1975 dollars) ($17.47 million, 1980 dollars). Product cost without profit is 8.63 $/kg of silicon (1975 dollars)(12.1 $/kg, 1980 dollars).
R.E.S.

N79-33566*# ARCO Solar, Inc., Chatsworth, Calif.
VACUUM DIE CASTING OF SILICON SHEET FOR PHOTOVOLTAIC APPLICATIONS Quarterly Report, 16 Mar. - 30 Jun. 1979
30 Jun. 1979 31 p Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-955325)
(NASA-CR-162360; DOE/JPL-955325-79/1; QR-1) Avail: NTIS HC A03/MF A01 CSCL 10A

The development of a vacuum die-casting process for producing silicon sheet suitable for photovoltaic cells with a terrestrial efficiency greater than 12 percent and having the potential to be scaled for large quantity production is considered. The initial approach includes: (1) obtaining mechanical design parameters by using boron nitride, which has been shown to non-wetting to silicon; (2) optimizing silicon nitride material composition and coatings by sessile drop experiments; (3) testing effectiveness of fluoride salt interfacial media with a graphite mold; and (4) testing the effect of surface finish using both boron nitride and graphite. When the material and mechanical boundary conditions are established, a finalized version of the prototype assembly will be constructed and the casting variables determined.
A.R.H.

N79-33567*# Siltec Corp., Menlo Park, Calif.
LSA LARGE AREA SILICON SHEET TASK ENHANCED I.D. SLICING TECHNOLOGY FOR SILICON INGOTS Quarterly Report, Feb. - Mar. 1979
Dorothea Walters Apr. 1979 22 p refs Sponsored by NASA and DOE Prepared for JPL
(Contract JPL-955282)
(NASA-CR-162359; DOE/JPL-955282-79/1; QR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

Development of inside diameter slicing technology to significantly increase the number of useable slices per inch of crystal over industry practice is discussed. The required reduction of both blade and slice thickness is to be accomplished by a combination of three key elements of slicing technology: (1) ingot rotation with minimum exposed blade area; (2) dynamic cutting edge control; and (3) the use of prefabricated insert blades. Design modifications on a slicing saw with microprocessor controls

and hardware fabrication to complete this conversion were initiated. Several runs were conducted on the engineering saw incorporating the method of ingot rotation. Ingots with diameters up to six inches were sliced successfully on a production saw. K.L.

N79-33568*# Wyle Labs., Inc., Huntsville, Ala. Solar Energy Systems Div.
INDOOR TEST FOR THERMAL PERFORMANCE OF THE GE TC-100 LIQUID SOLAR COLLECTOR EIGHT- AND TEN-TUBE CONFIGURATION
Sep. 1979 47 p Prepared for DOE
(Contract NAS8-32036)
(NASA-CR-161305; WYLE-TR-531-36R) Avail: NTIS HC A03/MF A01 CSCL 10A

The thermal performance of a liquid solar collector was tested in eight- and ten-tube configurations under simulated conditions. A time constant test and an incident angle modifier test were also conducted to determine the transient and incident angle effects on the collector. Performance loss with accessory covers is demonstrated. The gross collector area is about 17.4 ft sq without manifold and 19.1 ft sq with manifold. The collector weight is approximately 60 pounds empty and 75 pounds with manifold. K.L.

N79-33569*# Westinghouse Research and Development Center, Pittsburgh, Pa.
PHASE 2 OF THE ARRAY AUTOMATED ASSEMBLY TASK FOR THE LOW COST SOLAR ARRAY PROJECT Quarterly Report, 1 Apr. - 30 Jun. 1979
R. B. Campbell, P. Rai-Choundhury, E. J. Seman, A. Rohatgi, J. R. Davis, J. W. Ostroski, and R. E. Stapleton 5 Sep. 1979 26 p Prepared for JPL and DOE
(Contracts NAS7-100; JPL-954873)
(NASA-CR-162131; QR-7; DOE/JPL-954873-79/07) Avail: NTIS HC A03/MF A01 CSCL 10A

Two process specifications supplied by contractors were tested. The aluminum silk screening process resulted in cells comparable to those from sputtered Al. The electroless plating of contacts specification could be used only with extensive modification. Several experiments suggest that there is some degradation of the front junction during the Al back surface field (BSF) fabrication. A revised process sequence was defined which incorporates Al BSF formation. A cost analysis of this process yielded a selling price of $0.75/watt peak in 1980. A.R.H.

N79-33570*# Owens-Illinois, Inc., Toledo, Ohio.
OWENS-ILLINOIS SUBSYSTEM DESIGN PACKAGE FOR THE SEC-601 AIR-COOLED SOLAR COLLECTOR
Feb. 1979 19 p Prepared for DOE
(Contract NAS8-32259)
(NASA-CR-161094) Avail: NTIS HC A02/MF A01 CSCL 10A

The subsystem design of the SEC-601 solar collector was evaluated. The collector is of modular design and is approximately 12 feet three inches wide and eight feet seven inches tall. It contains 72 collector tube elements and weighs approximately 300 pounds. Included in this report are the subsystem performance specifications and the assembly and installation drawings of the solar collectors and manifold. R.E.S.

N79-33571*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA TECH HOUSE: AN EARLY EVALUATION
1977 23 p refs
(NASA-TM-80751) Avail: NTIS HC A02/MF A01 CSCL 10A

An architect-engineering firm, as well as university participants, performed system studies, evaluated construction methods, performed cost effectiveness studies, and prepared construction drawings which incorporated the selected technology features into a final design. A Technology Utilization House (Tech House) based on this design was constructed at the NASA Langley Research Center in Hampton, Virginia. The Tech House is instrumented so that the performance of the design features and energy systems can be evaluated during a planned family live-in period. As such, the house is both a demonstration unit and a research laboratory. The Tech House is to demonstrate the kind of single-family residence that will probably be available within the next five years. G.Y.

N79-33572*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANNEALING OF RADIATION DAMAGE IN 0.1- AND 2-OHM-CENTIMETER SILICON SOLAR CELLS
Irving Weinberg and Clifford K. Swartz Oct. 1979 13 p refs
(NASA-TP-1559; E-9997) Avail: NTIS HC A02/MF A01 CSCL 10A

Isochronal and isothermal annealing studies were conducted on 0.1 and 2 ohm centimeter n(+)/p silicon cells after irradiation by 1 MeV electrons at fluences of 10 to the 14th power, 5 times 10 to the 14th power, and 10 to the 15th power per square centimeter. For the 0.1 ohm centimeter cells, reverse annealing was not observed in the isochronal data. However, reverse annealing was observed between approximately 200 and 325 C in the isochronal data of the 2 ohm centimeter cells. Isothermal annealing of 0.1 ohm centimeter cells at 500 C restored pre-irradiation maximum power P sub max within 20 minutes at fluence = 10 to the 14th power, in 180 minutes at fluence = 5 times 10 to the 14th power and to 92 percent of pre-irradiation P sub max in 180 minutes for fluence = 10 to the 15th power. Annealing at 450 C was found inadequate to restore 0.1 ohm centimeter cell performance within reasonable times for all fluence levels. By comparison, at 450 C, the P sub max of 2 ohm centimeter cells was restored within 45 minutes, for the two highest fluence levels, while for the lowest fluence, restoration was completed within 15 minutes. Spectral response data indicate that, for both resistivities, degradation occurs predominantly in the cells p-type base region. Author

N79-33573*# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeroneutronic Div.
PHASE 1 OF THE FIRST SOLAR SMALL POWER SYSTEM EXPERIMENT (EXPERIMENTAL SYSTEM NO. 1). VOLUME 1: TECHNICAL STUDIES FOR SOLAR POINT-FOCUSING, DISTRIBUTED COLLECTOR SYSTEM, WITH ENERGY CONVERSION AT THE COLLECTOR, CATEGORY C Final Report
T. B. Clark, ed. 5 May 1979 294 p Prepared for JPL 3 Vol.
(Contract NAS7-100; JPL-955115)
(NASA-CR-162369; U-6529-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 10A

The technical and economic feasibility of a solar electric power plant for a small community is evaluated and specific system designs for development and demonstration are selected. All systems investigated are defined as point focusing, distributed receiver concepts, with energy conversion at the collector. The preferred system is comprised of multiple parabolic dish concentrators employing Stirling cycle engines for power conversion. The engine, AC generator, cavity receiver, and integral sodium pool boiler/heat transport system are combined in a single package and mounted at the focus of each concentrator. The output of each concentrator is collected by a conventional electrical distribution system which permits grid-connected or stand-alone operation, depending on the storage system selected. K.L.

N79-33574*# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
PHASE 1 OF THE FIRST SOLAR SMALL POWER SYSTEM EXPERIMENT (EXPERIMENTAL SYSTEM NO. 1). VOLUME 2: APPENDIX A - D Final Report
T. B. Clark, ed. 5 May 1979 279 p Prepared for JPL 3 Vol.
(Contract NAS7-100; JPL-955115)
(NASA-CR-162370; U-6529-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 10A

Recommended conceptual designs for the baseline solar concentrator and electrical subsystems are defined, and trade offs that were evaluated to arrive at the baseline systems are presented. In addition, the developmental history of the Stirling engine is reviewed, the U4 configuration is described, and a Stirling engine heat pipe system is evaluated for solar application where sodium vapor is used as the heat source. An organic

Rankine cycle engine is also evaluated for solar small power system application. K.L.

N79-33576*# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
PHASE 1 OF THE FIRST SOLAR SMALL POWER SYSTEM EXPERIMENT (EXPERIMENTAL SYSTEM NO. 1). VOLUME 3: APPENDIX E - N Final Report
T. B. Clark, ed. 5 May 1979 187 p Prepared for JPL 3 Vol.
(Contract NAS7-100; JPL-955115)
(NASA-CR-162371; U-6529-Vol-3) Avail: NTIS HC A09/MF A01 CSCL 10A

The design of a solar electric power plant for a small community is reported. Topics covered include: (1) control configurations and interface requirements for the baseline power system; (2) annual small power system output; (3) energy requirements for operation of the collectors and control building; (4) life cycle costs and reliability predictions; (5) thermal conductivities and costs of receiver insulation materials; (6) transient thermal modelling for the baseline receiver/thermal transport system under normal and inclement operating conditions; (7) high temperature use of sodium; (8) shading in a field of parabolic collectors; and (9) buffer storage materials. K.L.

N79-33576*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PHASE 1 OF THE FIRST SMALL POWER SYSTEM EXPERIMENT (ENGINEERING EXPERIMENT NO. 1). VOLUME 1: EXECUTIVE SUMMARY Final Report
R. J. Holl May 1979 69 p Prepared for JPL 5 Vol.
(Contract NAS7-100; JPL-955117)
(NASA-CR-162372; MDC-G7833-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 10A

The development of a modular solar thermal power system for application in the 1 to 10 MWe range is presented. The system is used in remote utility applications, small communities, rural areas, and for industrial uses. Investigations are performed on the energy storage requirements and type of energy storage, concentrator design and field optimization, energy transport, and power conversion subsystems. The system utilizes a Rankine cycle, an axial flow steam turbine for power conversion, and heat transfer sodium for collector fluid. A.W.H.

N79-33577*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PHASE 1 OF THE FIRST SMALL POWER SYSTEM EXPERIMENT (ENGINEERING EXPERIMENT NO. 1). VOLUME 2: SYSTEM CONCEPT SELECTION Final Report
R. J. Holl May 1979 312 p Prepared for JPL 5 Vol.
(Contract NAS7-100; JPL-955117)
(NASA-CR-162373; MDC-G7833-Vol-2) Avail: NTIS HC A14/MF A01 CSCL 10A

The development of a modular solar thermal power system for application in the 1 to 10 MWe range is presented. The system is used in remote utility applications, small communities, rural areas, and for industrial uses. Systems design and systems optimization studies are conducted which consider plant size, annual capacity factors, and startup time as variables. Investigations are performed on the energy storage requirements and type of energy storage, concentrator design and field optimization, energy transport, and power conversion subsystems. The system utilizes a Rankine cycle, an axial flow steam turbine for power conversion, and heat transfer sodium for collector fluid. A.W.H.

N79-33578*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PHASE 1 OF THE FIRST SMALL POWER SYSTEM EXPERIMENT (ENGINEERING EXPERIMENT NO. 1). VOLUME 3: EXPERIMENTAL SYSTEM DESCRIPTIONS Final Report
R. J. Holl May 1979 361 p Prepared for JPL 5 Vol.
(Contract NAS7-100; JPL-955117)
(NASA-CR-162374; MDC-G7833-Vol-3) Avail: NTIS HC A16/MF A01 CSCL 10A

The design and development of a modular solar thermal power system for application in the 1 to 10 MWe range is described. The system consists of five subsystems: the collector, power conversion, energy transport, energy storage, and the plant control subsystem. The collector subsystem consists of concentrator, receiver, and tower assemblies. The energy transport subsystem uses a mixture of salts with a low melting temperature to transport thermal energy. A steam generator drives a steam Rankine cycle turbine which drives an electrical generator to produce electricity. Thermal and stress analysis tests are performed on each subsystem in order to determine the operational reliability, the minimum risk of failure, and the maintenance and repair characteristics. A.W.H.

N79-33579*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PHASE 1 OF THE FIRST SMALL POWER SYSTEM EXPERIMENT (ENGINEERING EXPERIMENT NO. 1). VOLUME 4: COMMERCIAL SYSTEM DEFINITION Final Report
R. J. Holl May 1979 113 p Prepared for JPL 5 Vol.
(Contract NAS7-100; JPL-955117)
(NASA-CR-162375; MDC-G7833-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 10A

The development and design of a modular solar thermal power system for application in the 1 to 10 MWe range is described. The system is used in remote utility applications, small communities, rural areas, and for industrial uses. The operational reliability, the minimum risk of failure, and the maintenance and repair characteristics are determined and the commercial system design is defined. A.W.H.

N79-33580*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PHASE 1 OF THE FIRST SMALL POWER SYSTEM EXPERIMENT (ENGINEERING EXPERIMENT NO. 1). VOLUME 5: SUPPORTING ANALYSES AND TRADE STUDIES Final Report
R. J. Holl May 1979 210 p refs Prepared for JPL 5 Vol.
(Contracts NAS7-100; JPL-955117)
(NASA-CR-162376; MDC-G7833-Vol-5) Avail: NTIS HC A10/MF A01 CSCL 10A

The development and design of a modular solar thermal power system for application in the 1 to 10 MWe range is described. The system is used in remote utility applications, small communities, rural areas, and for industrial uses. Thermal and stress analyses are performed on the collector subsystem, energy storage subsystem, energy transport subsystem, the power conversion subsystem, and the plant control subsystem. A.W.H.

N79-33581*# United Technologies Corp., South Windsor, Conn. Power Systems Div.
ADVANCED TECHNOLOGY LIGHT WEIGHT FUEL CELL PROGRAM Final Report, 9 May 1977 - 16 Jun. 1978
R. E. Martin 16 Jun. 1978 73 p refs
(Contracts NAS3-20621; NAS3-20604)
(NASA-CR-159653; FCR-1017) Avail: NTIS HC A04/MF A01 CSCL 10A

A high performance hydrogen-oxygen alkaline fuel cell was investigated. Cell performance goals include: 0.9 volts at a current density of 1000 amperes per sq ft for 3000 hours at a cell temperature up to 300 F and reactant pressure up to 250 psia. Subscale research cells were tested in the evaluation of five anode and five cathode catalyst configurations. Fuel cell matrices were fabricated from NASA supplied polybenzimidazole (PBI) powder. A cell edge frame and PBI matrix samples were corrosion tested in 42 wt% KOH at 250 F (121 C). A total of 13,828 hours of research cell testing at 250 F was completed. In addition 494 hours of testing at temperatures up to 300 F and reactant pressures up to 250 psia with 27 hours of operation at or above 0.9 V/c at 1000 ASF was completed. A supported platinum-on-carbon catalyst configuration demonstrated stable operation at high temperature. A new cell edge frame structure showed low weight loss during corrosion testing, an indication of the material stability and long life potential. J.M.S.

N79-33582# Energy Research Corp., Danbury, Conn.
IMPROVEMENT OF PHOSPHORIC ACID FUEL CELL STACKS Interim Technical Report, Aug. 1977 - Nov. 1978
S. G. Abens, F. J. Ascenzo, B. S. Baker, G. Garretson, and M. Lambrech May 1979 71 p refs
(Contract DAAK70-77-C-0174)
(AD-A070881) Avail: NTIS HC A04/MF A01 CSCL 10/3

Phosphoric acid fuel cell components and stack assembly methods were evaluated. Electrodes with Pt loading between 0.3 and 0.9 g/sq. ft. were employed. Matrix materials were phenolic (Kynol) fibers and SiC. Graphite bipolar plates with 33% phenolic resin binder were used. Stacks were tested on hydrogen and simulated reformed methanol for up to 6,800 hours. An 80-cell (2.1 kW) stack was built and delivered to MERADCOM. GRA

N79-33583# Johns-Manville Sales Corp., Denver, Colo. Research and Development Center.
PERFORMANCE EVALUATION OF SOLAR FILMS AND SCREENS Final Report, 6 Jun. - Sep. 1978
Ronald R. Bishop Apr. 1979 75 p refs
(Contract DAAK70-78-D-0002)
(AD-A070636; USAFESA-TSD-2060) Avail: NTIS HC A04/MF A01 CSCL 13/1

The use of solar films and screens to reduce energy usage is surveyed by means of Market and Literature Surveys that provide basic information on the availability, manufacture, function, cost, and solar optical properties of solar films and screens. A simplified method of determining potential energy savings is given in a step by step format that includes consideration of solar heat gain, heat loss, and daylighting aspects of the application of solar films and screens. This simplified hand calculation procedure should provide an interim means of providing the energy saving information required by the Energy Conservation Investment Program. More sophisticated methods of calculation are under development by the Lawrence Berkeley Laboratory. At this time, it appears that for most regions of the country, flexible window shading that can be adjusted during the day or from season to season offer the most potential to saving energy. GRA

N79-33584# DCS Corp., Arlington, Va.
STATUS OF THERMAL IMAGING TECHNOLOGY AS APPLIED TO CONSERVATION
D. L. Shumaker, F. J. Snow, R. C. Barthle, T. L. Culp, and J. T. Wood Dec. 1978 115 p
(Contract EM-78-C-01-4228)
(HCP/M4228-01) Avail: NTIS HC A06/MF A01

The application of both imaging and non-imaging infrared equipment in the performance of thermal surveys is discussed, and a concise up-to-date status of the commercial availability and performance of infrared surveys for the detection of heat loss/heat gain in buildings is provided. DOE

N79-33585# Spire Corp., Bedford, Mass.
BROADENED CAPABILITIES IN ELECTROSTATIC BONDING FOR SOLAR CELL COVER GLASSES Interim Technical Report, Jan. - Dec. 1978
Peter R. Younger, Geoffrey A. Landis, and Roger G. Tobin Mar. 1979 84 p refs
(Contract F33615-77-C-3120)
(AD-A070741; IR-79-10057-01; AFAPL-TR-79-2008) Avail: NTIS HC A05/MF A01 CSCL 13/8

This report describes the first 12 months of a program aimed at furthering the development of electrostatic bonding techniques, so that integral glass covers can be attached to a variety of solar cell types, including those with multiple-layer antireflection (MLAR) coatings, the vertical junction cell, and texture etched cells. The electrostatic bonding facility is described. Tests of electron darkening of cover glasses are discussed. Detailed results of efforts to apply integral covers to various groups of MLAR coated cells are given. Variations upon the program baseline cell are to be tested to determine their compatibility with the electrostatic bonding process. Variations in contact metallization tested to date are discussed. Other variations include junction depth, dimensions (both lateral and thickness), and inclusion of back surface fields and wraparound contacts. GRA

N79-33586# TRW Energy Systems, Redondo Beach, Calif.
ANALYSIS OF BATTERY STORAGE FOR COMMERCIAL BUILDINGS, PHASE 1 Final Report
Sep. 1978 107 p refs
(Contract EC-77-C-02-4556)
(COO-4556-2) Avail: NTIS HC A06/MF A01

The application of battery storage to load leveling by the utility user represents a new concept in energy management. The possibility of combining an energy management computer/control system with a lead acid/power processor system was studied, and the feasibility of demonstrating power management at a government facility was explored. Candidate sites in the Washington, D. C. metropolitan area were evaluated by analyzing demand curves for electricity. One site, the Department of the Treasury's Bureau of Printing and Engraving is recommended as the best of the sites evaluated. Preliminary specifications are supplied. Facility modification and system layout are presented, giving alternate placements for the batteries. Floor loading and system safety are two critical design parameters. DOE

N79-33587# Mineral Economics Consultants, Inc., Swarthmore, Pa.
ENERGY REQUIREMENTS OF THE US PULP AND PAPER INDUSTRY
C. M. Cosman Jan. 1979 119 p refs
(Contract W-31-109-eng-38)
(ANL/EES/TM-42) Avail: NTIS HC A06/MF A01

The energy requirements of the U.S. pulp and paper industry were studied in an attempt to establish order of magnitude data. In view of the great divergency of products, processes, plant designs that reflect on specific energy consumption rates, it was not possible to provide much detail. The study is restricted to pointing out how public policy can help to channel the industry's efforts into less energy-intensive practices. Although recommendations are given, no specific process modifications were advised. R.E.S.

N79-33588# Department of Energy, Denver, Colo.
REGIONAL PROFILE, ENERGY-IMPACTED COMMUNITIES: REGIONAL 8
Mar. 1979 434 p
(DOE/TIC-10001) Avail: NTIS HC A19/MF A01

Data on population, administration, finance, housing, health and safety, human services, education, and water and sewage for 325 energy-impacted communities are presented. A review of current and potential energy developments in the region shows over 900 energy resource impacts listed for the 325 impacted communities. Coal development represents over one third of the developments listed. Energy conversion initiatives represent another high incidence of energy resource impact, with uranium development following closely. These projections indicate continued development of regional energy resources to serve national energy requirements. The 325 impacted communities as reported: Colorado (46), Montana (73), North Dakota (62), South Dakota (21), Utah (80), and Wyoming (43) illustrates that no area of the region will escape the impacts of energy development. DOE

N79-33589# Argonne National Lab., Ill. Energy and Environmental Systems Div.
TRANSPORTATION ENERGY CONSERVATION (TEC) ENVIRONMENTAL DEVELOPMENT PLAN
M. J. Bernard, III 1978 22 p Presented at DOE/TEC Div. Highway Vehicle Systems Contractors' Coordinating Meeting, Troy, Mich., 9-12 May 1978
(Contract W-31-109-eng-38)
(ANL/EES/CP-11; Conf-7805102-1) Avail: NTIS HC A02/MF A01

The goal of the National Environmental Policy Act of 1969 is shown. The act requires the preparation of Environmental Impact Statements (EIS) for major Federal actions significantly affecting the quality of the human environment. The process, as implemented by DOE, to produce an EIS for a technology program or demonstration is expected to have in chronological order, (1) an environmental development plan with annual updates, (2) an environmental assessment (EA), a negative determination (ND) or a draft environmental impact statement (DEIS), and (3) a final environmental impact statement (EIS). The EA details the expected environmental impacts thus allowing the decision between preparing ND or a DEIS. Public reviews of the DEIS are held for revisions before the EIS becomes finalized. DOE

N79-33590# Ottawa Univ. (Ontario).
FOREST METEOROLOGY: RESEARCH NEEDS FOR AN ENERGY AND RESOURCE LIMITED FUTURE

B. A. Hutchison, ed. Feb. 1979 50 p Workshop held at Ottawa, 28-30 Aug. 1978
(Contract EY-76-C-05-3688)
(CONF-7808100) Avail: NTIS HC A03/MF A01

Turbulent exchanges and radiation energy changes within and above forests are discussed. It is concluded that: (1) the mechanisms by which turbulence is created, transported, and destroyed in forest canopies must be examined; (2) the physical structural characteristics of forest vegetation controlling turbulent exchanges across porous forest canopy surfaces and at biomass surfaces must be identified and quantified; (3) the relation between forest structure and radiation microclimate must be clarified; and (4) the models which simulate and predict radiation in agricultural crops must be validated in forests. DOE

N79-33591# Little (Arthur D.), Inc., Cambridge, Mass.
IMPACT OF NATIONAL ENERGY AND ENVIRONMENTAL POLICIES ON INDUSTRY LOCATION DYNAMICS: A METHODOLOGICAL REVIEW
Feb. 1979 222 p refs
(Contract EJ-78-C-01-2833)
(DOE/TIC-10129) Avail: NTIS HC A10/MF A01

The findings are presented of a study performed to assess the pertinent theoretical and empirical literature on industry location dynamics, with emphasis on energy-intensive industries in order to help guide DOE's subsequent research activities in analyzing the impact of national energy and environmental policies on industrial location and regional growth patterns. The nine chapters are entitled: Summary; Identification of Energy-Intensive Industries for Analytical Emphasis; National Energy Policies and Their Implications for the Dynamics of Industrial Location; Environmental Regulations and Their Implications for the Dynamics of Industrial Location for Energy-Intensive Industries; Industrial Location Theory; An Overview; Empirical Analyses of Industrial Location: Partial Equilibrium Location; Empirical Analyses of the Dynamics of Industrial Location: General Equilibrium Approaches; Demonstration 1: A Partial Equilibrium Approach to an Analysis of the Impact of Energy Policies on the Dynamics of Industrial Location: and Demonstration 2: Experimental Illustrative Application of the Partial Equilibrium Approach. DOE

N79-33592# Swedish Council for Building Research, Stockholm.
STORAGE OF HEAT: A SURVEY OF EFFORTS AND POSSIBILITIES
Gunnar Wettermark, Bo Carlsson, and Hans Stymne 1979 162 p refs
(PB-295936/9; ISBN-91-540-2955-4) Avail: NTIS HC A08/MF A01 CSCL 13B

Various methods are described for storing heat. Topic areas discussed include the following: the role of heat storage in different energy systems; heat storage with passive and active solar heat systems; sensible heat; latent heat - phase change; thermochemical reactions; the American program for storage of heat. GRA

N79-33593# New Mexico Energy Inst., Las Cruces.
DEVELOPMENT OF RETROFIT ENERGY CONSERVATION AND SOLAR HEATING SYSTEMS, PHASE 1 Final Report
W. Reed Edgel Sep. 1978 138 p refs Sponsored in part by New Mexico Energy and Minerals Dept.
(PB-295847/8; NMEI-20) Avail: NTIS HC A07/MF A01 CSCL 13A

The type and frequency of use of various construction systems and HVAC systems in existing buildings in New Mexico was examined. Several of the most frequently occurring combinations of buildings and HVAC systems were selected; and the materials, components, and subsystems which could be used in retrofit energy conservation and solar heating applications were identified. When existing thermal envelope assessment and retrofit solar heating system design were complete, performance and cost comparisons with the unimproved buildings were made to determine cost effectiveness and energy savings. GRA

N79-33594# National Technical Information Service, Springfield, Va.
FUEL CELLS, VOLUME 3. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1977 - Jun. 1979
Diane M. Cavagnaro Jul. 1979 244 p Supersedes NTIS/PS-78/0633, NTIS/PS-77/0544, NTIS/PS-76/0507, NTIS/PS-75/479, and COM-74-11533
(NTIS/PS-79/0717/3; NTIS/PS-78/0633; NTIS/PS-77/0544; NTIS/PS-76/0507; NTIS/PS-75/479; COM-74-11533) Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

Fuel cell applications, components, fabrication, design, catalysts, and chemistry are covered. The bibliography includes different types of fuel cells, such as hydrogen oxygen cells, hydrocarbon air cells, and biochemical cells. This updated bibliography contains 235 abstracts 97 of which are new entries to the previous edition. GRA

N79-33595# National Technical Information Service, Springfield, Va.
HYDROCARBON FUEL CELLS. CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE Report, 1967 - Apr. 1979
Diane M. Cavagnaro Jul. 1979 135 p Supersedes NTIS/PS-78/0651
(NTIS/PS-79/0718/1; NTIS/PS-78/0651) Avail: NTIS HC $28.00/MF $28.00 CSCL 10B

This bibliography cites worldwide research on hydrocarbon fuel cells. The citations cover applications, design, performance, fabrication, catalysts, and electrochemistry. This updated bibliography contains 128 abstracts, 3 of which are new entries to the previous edition. GRA

N79-33596# National Bureau of Standards, Washington, D. C. Building Thermal and Service Systems Div.
TESTING OF PEBBLE-BED AND PHASE-CHANGE THERMAL ENERGY STORAGE DEVICES ACCORDING TO ASHRAE STANDARD 94-77 Final Report
Dennis E. Jones and James E. Hill May 1979 45 p refs Sponsored in part by DOE
(PB-295898/1; NBSIR-79-1737) Avail: NTIS HC A03/MF A01 CSCL 10C

The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) recently adopted ASHRAE Standard 94-77 Methods of Testing Thermal Storage Devices Based on Thermal Performance. Experiments were completed at the National Bureau of Standards in which a 7 cu m (250 cu ft) pebble-bed and a similarly-sized 164 MJ (250,000 Btu) phase-change unit using sodium sulfate decahydrate, both using air as the transfer fluid, were tested in accordance with this Standard. A description of the test procedure, test apparatus, and detailed test results is given. Some problems were encountered in using the Standard for these kinds of thermal energy storage devices, and modifications to the Standard are recommended based on these experiments. GRA

N79-33597# National Bureau of Standards, Washington, D. C. Electron Devices Div.
STANDARDS FOR PHOTOVOLTAIC ENERGY CONVERSION SYSTEMS Final Report, Feb. - Sep. 1978
Harry A. Schaft May 1979 19 p refs Prepared for Solar Energy Research Institute
(Contract EG-77-C-01-4042)
(PB-296274/4; NBSIR-79-1743) Avail: NTIS HC A02/MF A01 CSCL 10B

The results are presented of a search for existing domestic standards and related documents for possible application in the development of a standards base for photovoltaic energy conversion systems. The search resulted in locating about 150 test methods, recommended practices, standards, solar-thermal performance criteria, and other standards-related documents. They are listed by topic areas in the appendix. The listing was prepared to assist those involved in developing performance criteria for photovoltaic systems and in identifying methods of test system performance against these criteria. It is clear from the results of the search that few standards are directly applicable to terrestrial solar photovoltaic systems and that much standard development is required to support the commercialization of such systems. GRA

N79-33598# United Nations Industrial Development Organization, Vienna (Austria).
TECHNOLOGY FOR SOLAR ENERGY UTILIZATION
Hans Kleinrath, U. G. Bhide, and Jean Paul Durand 1978

160 p Sponsored in part by Agency for International Development
(PB-296572/1) Avail: NTIS HC A08/MF A01 CSCL 10A

Work being done in various countries and institutions dealing with: (1) the conversion of solar energy into mechanical or electrical energy, (2) the design of solar collectors, (3) the utilization of solar energy in heating, cooling, distillation, drying and cooking, and (4) the transfer of technology is presented. GRA

N79-33599# State Univ. of New York at Albany. Atmospheric Sciences Research Center.
NEW YORK STATE SOLAR ENERGY ATLAS
Jul. 1978 182 p Sponsored by N.Y. State Energy R and D Authority
(PB-295453/5; NYSERDA-78/5) Avail: NTIS HC A09/MF A01 CSCL 10A

Total horizontal solar radiation measurements through 1978 for New York State are presented in hourly, daily, and monthly formats. Tables, maps, and charts describing this total irradiation at 15 New York State locations compose the bulk of the atlas. An explanatory text serves as a guide to the material, and a section of climatological tables for temperature, heating and cooling degree days, and cloud cover is included. For many solar energy applications, solar irradiation is better represented in terms of its direct and diffuse components. The results of five months of direct and diffuse solar irradiation measurements at three New York State sites is presented. GRA

N79-33600# New Mexico Energy Inst., Las Cruces.
DIELECTRIC DEVELOPMENT FOR GaAs SOLAR CELLS Technical Completion Report
W. W. Granneman (N. Mex. Univ., Albuquerque) and Chien-Sheng Su (N. Mex. Univ., Albuquerque) Jan. 1979 27 p Sponsored in part by New Mexico Energy and Minerals Dept.
(PB-295837/9; NMEI-21) Avail: NTIS HC A03/MF A01 CSCL 10B

Gallium phosphate passivation on gallium arsenide was studied for use in gallium arsenide solar cells. The gallium phosphate has good antireflective characteristics when applied to gallium arsenide. Metal-gallium phosphate-gallium arsenide capacitors were constructed so that capacitance versus voltage measurement could be made. Interface state densities were determined from the c-v curver. The fast interface state densities were excellent and the corresponding surface recombination velocities should be low. Using this passivation layer should yield a major improvement in gallium arsenide solar cell efficiency. GRA

N79-33601# International Science and Technology Inst., Inc., Washington, D. C.
DEVELOPING SMALL HYDROELECTRIC DAM POTENTIAL
Mary Lyon-Allen Apr. 1979 19 p Sponsored by Community Services Admin.
(PB-296238/9; CSA/LN-2391; CSA/Pam-6143-12) Avail: NTIS HC A02/MF A01 CSCL 10B

This is a report to inform local governments, legislators, Community Action Agencies, Community Development Corporations, and other community organizations of the importance of hydropower as a method to alleviate the impact of high energy prices on low-income persons. The potential of small hydro development is discussed as well as suggestions for communities to begin the process of feasibility assessment. GRA

N79-33602# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
ENERGY PROGRAMS AT THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY Quarterly Report, Jan. - Mar. 1979
Apr. 1979 29 p ref Sponsored in part by DOE
(PB-296217/3; APL/JHU-EQR-79-1) Avail: NTIS HC A03/MF A01 CSCL 10A

The report is devided into three sections. The first, Geothermal Energy Development Planning, contains reports on the progress of those geothermal related tasks where effort was concentrated during the quarter. The tasks include an ongoing Atlantic Coastal Plain Geothermal Energy Market Survey, the Delmarva Geothermal Development Prospectus, Evaluation of Federal Strategies for Hydrothermal Developments, and comments on limited tasks performed in support of the major tasks. The second section, Operational Research, Hydroelectric Power Development, includes reports on a method for quantifying institutional constraints and on institutional and regulatory restraints in New Jersey. The third section, Energy Conversion and Storage Techniques, contains a report on flywheel development. GRA

N79-33603# Community Services Administration, Washington, D. C.
SOLAR ENERGY POLICY
Jan. 1979 57 p refs
(PB-296193/6; CSA/NF-03; CSA/Pam-6143-10) Avail: NTIS HC A04/MF A01 CSCL 13A

The energy-related problems of the poor and near-poor are described. Including their lack of funds with which to pay sharply increasing utility bills, the decline in health and deterioration in living conditions when increasing numbers of families have to choose between food and energy, and in the cases of the elderly and the handicapped, a challenge to survival which they face. The Community Service Administration's energy-related policy goals are detailed. GRA

N79-33604# Florida Univ., Gainesville.
PROCEEDINGS OF THE U. S. NATIONAL CONFERENCE ON WIND ENGINEERING RESEARCH, 3RD
Bernard M. Leadon, ed. 1978 538 p refs Conf. held at Gainesville, Fla., 28 Feb. - 1 Mar. 1978
(Grant NSF PFR-77-10170)
(PB-296335/3; NSF/RA-780466) Avail: NTIS HC A23/MF A01 CSCL 13B

An exchange of information between engineers, architects, and scientists on wind-engineering problems and research is documented. The objectives set forth were: (1) to provide an opportunity for presentation of research activities and preliminary research findings; (2) to simulate discussion and interaction between research workers active in complementary subject areas; (3) to develop lines of communication and cooperation between research engineers, scientists and practicing engineers and architects; and (4) to identify subject areas that need more intensive research. Information on wind associated with severe storms (tornadoes), thunderstorm downbursts, hurricanes and downslope winds is presented. GRA

N79-33605# National Technical Information Service, Springfield, Va.
ENERGY SUPPLY AND DEMAND MODELING. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1964 - May 1979
Audrey S. Hundemann Jul. 1979 151 p Supersedes NTIS/PS-78/0599
(NTIS/PS-79/0665; NTIS/PS-78/0599) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

The use of energy models to estimate the supply and demand of electricity, oil, natural gas, coal, and petroleum products on national, regional, and state levels is discussed. The models cover residential, commercial, and industrial supply and demand; the impact of economic conditions on demand; energy use alternatives; and optimal allocation of regionally produced energy resources. Abstracts pertaining to design and development of energy models are included. GRA

N79-33606# Virginia Highway Research Council, Charlottesville.
ENERGY CONSERVATION IN DEPARTMENT OF HIGHWAYS AND TRANSPORTATION BUILDINGS Final Report, Jul. 1977 - Sep. 1978
Woodrow J. Halstead and Kenneth H. McGhee Sep. 1978 40 p
(PB-295675/3; VHTRC-79-R11; FHWA/VA-79-R11) Avail: NTIS HC A03/MF A01 CSCL 13A

The policy of the Virginia Department of Highways and Transportation toward energy conservation in the operation of its buildings and its recommendation for further measures for conserving energy is reported. GRA

N79-33607# Educational Facilities Labs., Inc., New York.
A REPORT ON THE DEVELOPMENT OF A MODEL ENERGY MANAGEMENT PROGRAM FOR NEW YORK STATE SCHOOLS, PHASE 2
Jul. 1978 144 p

(PB-295452/7; NYSERDA-78/7) Avail: NTIS HC A07/MF A01 CSCL 13A

Topic areas covered include: implementation of energy management programs; goals and elements of the plan; administrative organization; suggested activities and organizational strategies; incentive considerations; program cost estimates.

GRA

N79-33608# National Technical Information Service, Springfield, Va.

STATE-OF-THE-ART REVIEWS AND BIBLIOGRAPHIES ON ENERGY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - May 1979

Audrey S. Hundeman Jul. 1979 316 p Supersedes NTIS/PS-78/0586 and NTIS/PS-77/0520

(NTIS/PS-79/0639/9; NTIS/PS-78/0586; NTIS/PS-77/0520) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

Citations to bibliographies, state-of-the-art reviews, and literature surveys on various aspects of fossil fuels, wind, solar energy, hydrogen, geothermal energy, nuclear energy, and batteries are presented. A few citations pertain to electric power. (This updated bibliography contains 310 abstracts, 96 of which are new entries to the previous edition.) GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N79-33609 California Univ., Los Angeles.

ENVIRONMENTAL, SOCIOECONOMIC, AND CONSUMER PROTECTION ASPECTS OF SELECTED DECENTRALIZED SOLAR ENERGY APPLICATIONS Ph.D. Thesis

Steven Robert Sim 1979 202 p

Avail: Univ. Microfilms Order No. 7921455

The solar market was studied to determine if a meaningful amount of consumer problems with solar power had arisen. Extensive literature searches, widespread public comment and reaction, field visits to operating solar units, and a national workshop were utilized. The conclusions reached indicated that at least 20 percent of solar consumers experienced significant problems especially in installation of the units. Potential for future electricity generation through the conversion of solar energy was determined. The environmental and socioeconomic aspects of decentralized photovoltaic, wind, and solar thermal technologies were discussed. The conclusions indicated that environmental impacts of such technologies are relatively minor and those which existed are of the nature of public health considerations.

Dissert. Abstr.

N79-33610 Miami Univ., Coral Gables, Fla.

AIR POLLUTION: A MULTIDISCIPLINARY COURSE FOR UPPER DIVISION SCIENCE AND ENGINEERING STUDENTS Ph.D. Thesis

Harold Paul Gerrish 1979 250 p

Avail: Univ. Microfilms Order No. 7921773

A one semester undergraduate course including a comprehensive set of lecture notes, graphics homework exercises, and sample examination questions is presented. The course includes material on air quality indices, air quality in the occupational and in confined environments, dispersion techniques for parking facilities, foreign ambient and OSHA indoor air quality standards, emission factors, complex source analyses, developments of regional impact (DRI), environmental impact statements (EIS), and air pollution in planning. Dissert. Abstr.

N79-33611*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

MEASUREMENT TECHNIQUES FOR TRACE METALS IN COAL-PLANT EFFLUENTS: A BRIEF REVIEW

Jag J. Singh Washington Oct. 1979 34 p refs

(NASA-RP-1047; L-13164) Avail: NTIS HC A03/MF A01 CSCL 13B

The strong features and limitations of techniques for determining trace elements in aerosols emitted from coal plants are discussed. Techniques reviewed include atomic absorption spectroscopy, charged particle scattering and activation, instrumental neutron activation analysis, gas/liquid chromatography, gas chromatographic/mass spectrometric methods, X-ray fluorescence, and charged-particle-induced X-ray emission. The latter two methods are emphasized. They provide simultaneous, sensitive multielement analyses and lend themselves readily to depth profiling. It is recommended that whenever feasible, two or more complementary techniques should be used for analyzing environmental samples. K.L.

N79-33612*# Maryland Univ., College Park. Dept. of Microbiology.

STUDY TO DETERMINE THE AQUATIC BIOLOGICAL EFFECTS ON THE SOLID ROCKET BOOSTER (SRB) Final Report, 15 Dec. 1977 - 15 May 1979

R. R. Colwell and A. Zachary May 1979 54 p

(Contract NAS8-32148)

(NASA-CR-161307) Avail: NTIS HC A04/MF A01 CSCL 13B

The surface of the reusable solid rocket boosters (SRB), which are jettisoned from the Shuttle Orbiter to parachute in the sea, are studied for colonization by marine life. Techniques for monitoring the marine microbial fouling of SRB materials are presented. An assessment of the nature and degree of the biofouling expected on the SRB materials in the recovery zone is reported. A determination of the degree and the effects of seasonal variation occurring on microbial fouling in the retrieval zone waters is made. The susceptibility of the SRB parachute recovery system to microbial fouling and biodeterioration is investigated. The development of scanning electron microscopy and epifluorescence microscopic observation techniques for rapid assessment of microbial fouling is discussed. A.W.H.

N79-33613# MSA Research Corp., Evans City, Pa.

FEASIBILITY STUDY OF SELF-CONTAINED ENVIRONMENTAL CONTROL UNIT Final Report

M. J. McGoff and J. W. Mausteller Washington DOT Nov. 1978 117 p

(Contract DOT-CG-73210-A)

(AD-A071154; MSAR-78-58; USCG-D-04-79) Avail: NTIS HC A06/MF A01 CSCL 13/2

This feasibility study pertained to defining requirements, surveying available equipment, devising and evaluating concepts, and making recommendations for development of a self-contained environmental control unit. A modular approach with field replacement is deemed necessary to conserve weight; otherwise, the ECU weight and bulk becomes cumbersome. Adoption of a head/vest water cooled undergarment with ice canisters for heat sinking is advised over use of filtered air cooling. A self-contained rebreather apparatus with a mask inside a protective helmet is recommended as a breathing supply. Both cooling and breathing modules are recommended to be located external to the protective suit. Use of the present POTMC protective suit with the modular ECU concept appears feasible, but evaluation will be required.

GRA

N79-33614# California Univ., Berkeley. Lawrence Berkeley Lab.

AQUATIC MICROCOSMS FOR ASSESSMENT OF EFFLUENT EFFECTS Final Report

John Harte, D. Levy, E. Lapan, A. Jassby, M. Dudzik, and J. Rees Nov. 1978 98 p refs

(Contract W-7405-eng-48; EPRI Proj. 939-1)

(EPRI-EA-936) Avail: NTIS HC A05/MF A01

Laboratory freshwater lake microcosms were studied with respect to their usefulness in providing a tool for environmental impact assessment. Three four month studies were carried out, each with a different pollutant expected to be found in significant concentration in the aqueous effluent from coal gasification operations. These studies have led to: (1) identification of those biological and chemical parameters most useful for evaluating the responses of microcosms to chemical pollutants; (2) characterization of the difficulties in obtaining replicate microcosms that approximately simulate natural systems; (3) a test of the usefulness of microcosms in evaluating hypothetical stability indicators; (4) evaluation of the relative usefulness of the bloom and the quiescent stages of microcosm development for impact assessment studies; and (5) a specific research plan

for determining optimum procedures for microcosm design, initiation, and operation. DOE

N79-33615# California Univ., Livermore. Lawrence Livermore Lab.
TREATMENT OF INITIAL AND BOUNDARY CONDITIONS IN THE APPLICATION OF AIR QUALITY MODELS
William H. Duewer Apr. 1979 19 p refs
(Contract W-7405-eng-48)
(UCID-18159) Avail: NTIS HC A02/MF A01

The importance of the initial boundary conditions, especially for ozone/oxidants in the establishment of an air quality simulation model is presented. It was concluded that the specification of initial and boundary conditions remains a major problem in the verification and application of air quality models, and all proposed solutions to the problem are of an essentially ad hoc nature. Moreover, existing data collection efforts seem unlikely to significantly improve matters. DOE

N79-33616# Radian Corp., Austin, Tex.
NITROGEN OXIDE INTERFERENCES IN THE MEASUREMENT OF ATMOSPHERIC PARTICULATE NITRATES Final Report
L. A. Rohlack, W. C. Hawn, K. R. Williams, and T. P. Parsons Mar. 1979 74 p refs Sponsored by Elec. - Power Res. Inst.
(EPRI Proj. 801-1)
(EPRI-EA-1031-Vol-2) Avail: NTIS HC A04/MF A01

The results of an experimental program to evaluate the validity of reported atmospheric particulate nitrate concentration using high-volume sampling techniques are presented. Laboratory and field experiments were conducted to determine the extent of interference that gaseous nitrogen oxides introduce in the atmospheric nitrate determinations. The formation of artifact nitrate was studied as a function of time, filter type, filter pretreatment, particulate type and loading, temperature, humidity, nitric oxide, nitrous oxide, and ozone concentrations. The highest nitrate values were measured on glass-fiber filters at high nitric oxide and high humidity levels and low temperatures. In fact, the artifact nitrate formed during the collection of ambient samples at these worst-case conditions may be the major contributor to measured particulate nitrate values. The sorption of gaseous nitrogen oxides was reduced from 50 to 100% on teflon, polycarbonate, and acid-washed, glass-fiber filters compared to untreated glass-fiber filters. DOE

N79-33617# Argonne National Lab., Ill.
THE ADVANCED STATISTICAL TRAJECTORY REGIONAL AIR POLLUTION MODEL
Jack D. Shannon May 1979 38 p refs
(Contract W-31-109-eng-38)
(ANL/RER/79-1) Avail: NTIS HC A03/MF A01

The model is developed and shown to combine efficient calculation of long term horizontal dispersion with parameterizations of boundary layer processes. The parameterizations include diurnal and seasonal variations of dry deposition velocities for SO2 and sulfate, the rate of transformation from SO2 to sulfate, and the vertical structure of the planetary boundary layer. An additional parameterization is the treatment of wet deposition as a function of the half power of the hourly precipitation, an empirical result. Budget studies indicate that wet removal is greater than dry deposition within U.S. boundaries for sources within the U.S. particularly during winter, and that the net mass flux across the U.S.-Canadian border resulting from U.S. sources is three to four times greater than the net mass flux across the border resulting from Canadian sources. DOE

N79-33618# Radian Corp., Austin, Tex.
NITROGEN OXIDE INTERFERENCES IN THE MEASUREMENT OF ATMOSPHERIC PARTICULATE NITRATES Final Report
L. A. Rohlack, W. C. Hawn, K. R. Williams, and T. P. Parsons Mar. 1979 72 p
(EPRI-EA-1031-Vol-1) Avail: NTIS HC A04/MF A01

The results of an experimental program to evaluate the validity of reported atmospheric particulate nitrate concentrations using high-volume sampling techniques are reported. Laboratory and field experiments were conducted to determine the extent of interference that gaseous nitrogen oxides introduce in the atmospheric nitrate determinations. The formation of artifact nitrate was studied as a function of time, filter type, filter pretreatment, particulate type and loading, temperature, humidity, and nitric oxide, nitrous oxide, and ozone concentrations. The sorption of gaseous nitrogen oxides was reduced from 50 to 100% on teflon, polycarbonate, and acid-washed, glass-fiber filters compared to untreated glass-fiber filters. DOE

N79-33619# Oak Ridge National Lab., Tenn.
AIRDOS-EPA: A COMPUTERIZED METHODOLOGY FOR ESTIMATING ENVIRONMENTAL CONCENTRATIONS AND DOSE TO MAN FROM AIRBORNE RELEASE OF RADIONUCLIDES
R. E. Moore, C. F. Baes, III, L. M. McDowell-Boyer, A. P. Watson, F. O. Hoffman, J. C. Pleasant, and C. W. Miller Jun. 1979 270 p refs
(Contract W-7405-eng-26)
(ORNL-5532) Avail: NTIS HC A12/MF A01

The AIRDOS-EPA computer code is a methodology, designed for use on IBM-360 computers, that estimates radionuclide concentrations, in air; rates of deposition on ground surfaces; ground surface concentrations; intake rates via inhalation of air and ingestion of meat, milk, and fresh vegetables; and radiation doses to man from airborne releases of radionuclides. This report describes the atmospheric and terrestrial transport models used in the code, their computer implementation, and the applicability of the code to the assessment of radiological impacts. A listing of the code and a demonstration run of the code are presented. A modified Gaussian plume equation is used to estimate both horizontal and vertical dispersion of as many as 36 radionuclides released from one to six stacks or area souces. Radionuclide concentrations in meat, milk, and fresh produce consumed by man are estimated by coupling the output of the atmospheric transport models with the U.S. Nuclear Regulatory Commission, Regulatory Guide 1.109 terrestrial food chain models. Dose conversion factors are input to the code, and doses to man at each distance and direction specified are estimated for total body, red marrow, lungs, endosteal cells, stomach wall, lower large intestine wall, thyroid, liver, kidneys, testes, and ovaries through the following modes: immersion in air containing radionuclides, exposure to ground surfaces contaminated by deposited radionuclides, immersion in contaminated water, inhalation of radionuclides in air, and ingestion of food produced in the area. DOE

N79-33620# California Univ., Livermore. Lawrence Livermore Lab.
ZONAL MODEL CALCULATION OF THE CLIMATIC EFFECT OF INCREASED CO2
G. L. Potter Apr. 1979 24 p refs Presented at Symp. on Environmental and Climatic Impact of Coal Utilization, Williamsburg, Va., 17 Apr. 1979
(Contract W-7405-eng-48)
(UCRL-82540; Conf-790458) Avail: NTIS HC A02/MF A01

A preliminary numerical experiment to test the effect of changing atmospheric CO2 concentrations on the climate simulated by a zonal atmospheric model including numerous feedback mechanisms. The main results of this analysis may be summarized as follows: (1) increased CO2 concentrations warm the troposphere and reduce the intensity of the polar surface inversions; (2) the magnitude of the stratospheric temperature difference increased with altitude as CO2 concentrations were increased; (3) precipitation, evaporation and the total atmospheric water content increased with increasing CO2 concentrations, (The Bowen ratio (H/LE) decreased with increasing CO2). DOE

N79-33621# California Univ., Livermore. Lawrence Livermore Lab.
REPORT OF LAWRENCE LIVERMORE LABORATORY TO THE FAA ON THE HIGH ALTITUDE POLLUTION PROGRAM, 1978
F. Rederick M. Luther 30 Sep. 1978 54 p refs
(Contract W-7405-eng-48)
(UCRL-50042-78) Avail: NTIS HC A04/MF A01

Studies on model simulation of observed stratospheric variations were conducted with regard to: the natural stratosphere; possible variations in stratospheric ozone related to the 11 yr solar cycle; and effects of a solar eclipse on stratospheric

chemistry. Assessment studies were conducted on: (1) changes in ozone due to SST emissions, chlorofluoromethanes, and N2O; potential effects of space shuttle emissions; (2) potential effects of solar power satellite launch vehicles; (3) effects of a massive pulse injection of NO sub x into the stratosphere; (4) effects of stratospheric perturbations on the earth's radiation budget and the climatic implications; and (5) effect of ozone reductions on erythema dose. DOE

N79-33622# Environmental Monitoring and Support Lab., Las Vegas, Nev.
HAZARDOUS MATERIALS SPILL MONITORING: SAFETY HANDBOOK AND CHEMICAL HAZARD GUIDE, PART A Final Report
Llewellyn R. Williams, Eleftheria Calliga, and Robert W. Thomas Jan. 1979 49 p refs 2 Vol.
(PB-295853/6; EPA-600/4-79-008A) Avail: NTIS HC A03/MF A01 CSCL 06T

A safety and first aid reference is presented for personnel responding to spills of hazardous materials which may involve any of the 655 chemicals which are designated 'hazardous' by the U.S. Environmental Protection Agency. Safety considerations, first aid procedures, and descriptions of protective equipment are included. GRA

N79-33623# Environmental Monitoring and Support Lab., Las Vegas, Nev.
HAZARDOUS MATERIALS SPILL MONITORING: SAFETY HANDBOOK AND CHEMICAL HAZARD GUIDE, PART B Final Report
Llewelyn R. Williams, Eleftheria Calliga, and Robert W. Thomas Jan. 1979 674 p 2 Vol.
(PB-295854/4; EPA-600/4-79-008B) Avail: NTIS HC A99/MF A01 CSCL 06T

The 655 chemicals identified on the basis of known toxicity or spill history and designated 'hazardous' by the U.S. Environmental Protection Agency are indexed. A data sheet is included for each chemical showing its CAS number, synonyms, and hazard priority number, and giving information on hazards, safety measures, and exposure. GRA

N79-33624# Denver Research Inst., Colo.
SYMPOSIUM ON THE TRANSFER AND UTILIZATION OF PARTICULATE CONTROL TECHNOLOGY. VOLUME 1: ELECTROSTATIC PRECIPITATORS
F. P. Venditti, J. A. Armstrong, and Michael Durham Feb. 1979 424 p refs Symp. held at Denver, Colo., 24-28 Jul. 1978 4 Vol.
(Grant EPA-R-805725)
(PB-295226/5; EPA-600/7-79-044A-Vol-1) Avail: NTIS HC A22/MF A01; also available in set of 4 reports HC E19, PB-295225-SET CSCL 13B

The following topics are discussed: electrostatic precipitators (ESP's) for coal fired boilers; flue gas conditioning for ESP's; novel electrostatic precipitators; fundamentals-electrical and particle characteristics; industrial applications of ESP's. GRA

N79-33625# Denver Research Inst., Colo.
SYMPOSIUM ON THE TRANSFER AND UTILIZATION OF PARTICULATE CONTROL TECHNOLOGY. VOLUME 2: FABRIC FILTERS AND CURRENT TRENDS IN CONTROL EQUIPMENT
F. P. Venditti, J. A. Armstrong, and Michael Durham Feb. 1979 422 p refs Symp. held at Denver, Colo., 24-28 Jul. 1978 4 Vol.
(Grant EPA-R-805725)
(PB-295227/3; EPA-600/7-79-044B-Vol-2) Avail: NTIS HC A18/MF A01; also available in set of 4 reports HC E19, PB-295229-SET CSCL 13B

The three major categories of control technologies electrostatic precipitators, scrubbers, and fabric filters - were of major concern during the symposium. These technologies were discussed from the perspectives of economics; new technical advances in science and engineering; and applications. Several papers dealt with combinations of devices and technologies, leading to a concept of using a systems approach to particulate control, rather than device control. GRA

N79-33626# Denver Research Inst., Colo.
SYMPOSIUM ON THE TRANSFER AND UTILIZATION OF PARTICULATE CONTROL TECHNOLOGY. VOLUME 3: SCRUBBERS, ADVANCED TECHNOLOGY, AND HTP APPLICATIONS
F. P. Venditti, J. A. Armstrong, and Michael Durham Feb. 1979 500 p refs Symp. held at Denver, Colo., 24-28 Jul. 1978 4 Vol.
(Grant EPA-R-805725)
(PB-295228/1; EPA-600/7-79-044C-Vol-3) Avail: NTIS HC A21/MF A01; also available in set of 4 reports HC E19, PB-295229-SET CSCL 13B

The three major categories of control technologies were discussed from the perspectives of economics; new technical advances in science and engineering; and applications. Several papers dealt with combinations of devices and technologies, leading to a concept of using a systems approach to particulate control, rather than device control. This volume covers scrubbers, advanced technology, and high temperature high pressure applications. GRA

N79-33627# Denver Research Inst., Colo.
SYMPOSIUM ON THE TRANSFER AND UTILIZATION OF PARTICULATE CONTROL TECHNOLOGY. VOLUME 4: FUGITIVE DUSTS AND SAMPLING, ANALYSIS AND CHARACTERIZATION OF AEROSOLS
F. P. Venditti, J. A. Armstrong, and Michael Durham Feb. 1979 490 p refs Symp. held at Denver, Colo., 24-28 Jul. 1978 4 Vol.
(Grant EPA-R-805725)
(PB-295229/9; EPA-600/7-79-044D-Vol-4) Avail: NTIS HC A21/MF A01; also available in set of 4 reports HC E19, PB-295525-SET CSCL 13B

The three major categories of control technologies-electrostatic precipitators, scrubbers, and fabric filters - were of major concern during the symposium. These technologies were discussed from the perspectives of economics; new technical advances in science and engineering; and applications. Several papers dealt with combinations of devices and technologies, leading to a concept of using a systems approach to particulate control, rather than device control. GRA

N79-33628# South Coast Technology, Inc., Santa Barbara, Calif.
AN INITIAL ASSESSMENT OF THE LITERATURE ON THE MEASUREMENT, CONTROL, TRANSPORT, TRANSFORMATION AND HEALTH EFFECTS OF UNREGULATED DIESEL ENGINE EMISSIONS Final Report, Mar. 1978 - Jan. 1979
J. Andon, H. M. Siegel, J. H. Johnson, D. G. Leddy, and S. Smaby Jan. 1979 516 p refs
(Contract DOT-HS-7-01790)
(PB-296075/5; DOT-HS-804010) Avail: NTIS HC A22/MF A01 CSCL 04A

The four major topics treated are: (1) measurement and characterization of emissions; (2) control technology; (3) atmospheric transport, transformation, and microbiological assay; and (4) carcinogenic health aspects. GRA

N79-33629# Midwest Research Inst., Kansas City, Mo.
ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES, ACRYLONITRILE Final Report, Aug. 1977 - Dec. 1978
John E. Going, Phil Kuykendaho, Sue Long, John Onstot, and Ken Thomas Dec. 1978 285 p refs
(Contract EPA-68-01-4115)
(PB-295928; EPA-560/6-79-003) Avail: NTIS HC A13/MF A01 CSCL 07D

A sampling and analysis program was conducted to determine the levels of acrylonitrile in air, water, soil, and sediment around 11 industrial sites. The industrial sites included acrylonitrile and acrylamide producers, acrylic and modacrylic fiber producers, ABS and SAN resin producers, and nitrile elastomer producers. Air was collected at the perimeters of the industrial sites as 24-composites using charcoal adsorption tubes. Soil samples were collected at the air sampling stations. Grab water samples were collected upstream, downstream, and, if possible, at plant discharged. Air levels ranges from 0.1 to 325 microgram/cu m; water levels ranged from nondetectable to 4,300 microgram/liter. No acrylanitrile was found in the soils or sediments. The

sample extracts were analyzed by gas chromatography and confirmed by gas chromatography/mass spectrometry. GRA

N79-33630# Systems Applications, Inc., San Rafael, Calif.
A LAGRANGIAN APPROACH TO MODELING AIR POLLUTANT DISPERSION: DEVELOPMENT AND TESTING IN THE VICINITY OF A ROADWAY Final Report, Mar. - Sep. 1978
R. G. Lamb, H. Hogo, and L. E. Reid Apr. 1979 117 p refs
(Contract EPA-68-02-2733)
(PB-296095/3; EPA-600/4-79-023) Avail: NTIS HC A06/MF A01 CSCL 04A

A microscale roadway dispersion model based on Lagrangian diffusion theory was developed and tested. The model incorporates similarity expressions for the mean wind and turbulence energy in the atmospheric boundary layer, through which the effects of wind shear and atmospheric stability are taken into account, and a parameterization of vehicle wake turbulence. Through simple modifications, the model can be structured to treat particle settling, deposition, and resuspension, as well as buoyancy of the effluent material. Calm winds, winds parallel to the roadway, flows around depressed or elevated roadways, shallow mixed layers, and transient of spatially variable meteorological conditions can all be explicitly taken into account within the framework of the modeling approach. The model was tested by applying it to the 30-minute experimental periods reported in the General Motors sulfate study. Of the 1040 predicted values of the mean concentration of an inert material (SF6), half were found to be within +30 percent of the measured values. The overall correlation coefficient was 0.91. The computer time (but not core storage) required by the model is directly proportional to the distance between the farthest receptor and the road. For the studies reported the model requires on the average 20 seconds of CPU time on the CDC 7600 to simulate each of the 30-minute General Motors experiments. GRA

N79-33631# Biospherics, Inc., Rockville, Md.
EFFECTS OF INCREASES IN CARBON DIOXIDE IN THE EARTH'S ATMOSPHERE: A SYNTHESIS
Scott Smith Feb. 1979 17 p refs
(Contract NOAA-41-USC-252C/3)
(PB-297384/0; NOAA-79061205) Avail: NTIS HC A02/MF A01 CSCL 13B

The harmful effects on the environment caused by increasing amounts of carbon dioxide in the atmosphere are considered as well as an assessment on coordinate, interdisciplinary, and international programs to solve this problem. GRA

N79-33632# Data Resources, Inc., Lexington, Mass.
THE MACROECONOMIC IMPACT OF FEDERAL POLLUTION CONTROL PROGRAMS: THE 1978 ASSESSMENT
29 Jan. 1979 51 p
(Contract EQ8AC009)
(PB-296960/8) Avail: NTIS HC A04/MF A01 CSCL 13B

An analysis is given of the macroeconomic impacts of Federal air and water pollution control legislation on the U.S. economy. The analysis relies upon CEQ incremental abatement cost estimates. Figures were provided for capital investment, annualized capital costs, and operating and maintenance costs on an industry-by-industry basis, with additional data for state and local governments costs and costs associated with mobile source regulations. The figures reflect on incremental costs, i.e., the extra costs which occurred solely as the result of Federal legislation. GRA

N79-33633# Technology Service Corp., Santa Monica, Calif.
MONITORING CARBON MONOXIDE CONCENTRATIONS IN URBAN AREAS Final Report
W. S. Meisel and T. E. Dushane Apr. 1979 47 p refs Sponsored by Transportation Res. Board and Am. Assoc. of State Highway and Transportation Office and Federal Highway Admin.
(PB-296493/0; TRB/NCHRP/REP-200; ISBN-0-309-02904-X) Avail: NTIS MF A01; HC available from Transportation Research Board, 2101 Constitution Ave., NW. Washington, D. C. 20418

The annual second 8 hour maximum and the annual second 1 hour maximum were analyzed. It was found that, between the two standards, the 8 hour is by far the binding one. Focusing on the second annual 8 hour maximum, it was also found that the extrapolation from as little as one month of CO sampling at a proposed highway site could be performed using existing CO auxiliary data, existing meteorological data, or no auxiliary data at all. As long as monitoring is done during the CO season of October-January, with February as a possible addition an extrapolation can be performed, even without auxiliary data. The confidence intervals of the error were comparable with the intrinsic variability of the annual statistics estimated. GRA

N79-33634# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
THE AEROMETRIC AND EMISSIONS REPORTING SYSTEM (AEROS) MANUAL SERIES. VOLUME 2: AEROS USER'S MANUAL, UPDATE NUMBER 2
Mar. 1979 264 p
(PB-296266/0; EPA-450/2-76-029-2; OAQPS-1.2-039-2) Avail: NTIS HC A12/MF A01 CSCL 13B

User procedures for SAROAD (storage and retrieval of aerometric data) are presented along with guidelines for compiling a comprehensive emission inventory. The procedures are current at present but are subject to continual update and revision. R.E.S.

N79-33635# Technology Service Corp., Santa Monica, Calif.
DEVELOPMENT OF IMPROVED METHODS FOR PREDICTING AIR QUALITY LEVELS IN THE SOUTH COAST AIR BASIN Final Report, 1974 - 1977
Melvin D. Zelden and Joseph C. Cassmassi Mar. 1979 385 p refs
(PB-296098/7; TSC-PD-B572-10; ARB-R-A6-192-30-79-97) Avail: NTIS HC A17/MF A01 CSCL 13B

Improved methods to predict oxidant, sulfate and sulfur dioxide levels in the South Coast Air Basin (SCAB) were developed. The new algorithms developed provide substantially improved capability for same-day predictions and to a lesser degree day-in-advance predictions. Additional findings of the study were: (1) the statistical relationship between meteorology and pollutant concentrations degrade rapidly as the lead-time increases, such that historical data are ineffective for 30 hour predictions; (2) the use of prognostic charts from numerical computer models have improved day-in-advance prediction methods; and (3) the inclusion of emission factors does not appreciably improve prediction accuracies over those obtained from meteorological data alone. GRA

N79-33636# Washington State Univ., Pullman.
TESTING OF HYDROCARBON EMISSIONS FROM VEGETATION, LEAF LITTER AND AQUATIC SURFACES, AND DEVELOPMENT OF A METHODOLOGY FOR COMPILING BIOGENIC EMISSION INVENTORIES Final Report
Patrick R. Zimmerman Feb. 1979 112 p refs
(PB-296070/6; EPA-450/4-79-004) Avail: NTIS HC A06/MF A01 CSCL 13B

A general methodology is outlined for estimating emission rates of volatile organic compounds (VOC) from vegetation, soil/leaf litter, and surfaces of bodies of water. Techniques are prescribed for sample collection and analysis as well as for extrapolating the emission rates determined to estimate biogenic VOC emissions over any area. Emission factors are presented for broad classes in the conterminous U.S. Emission inventory procedures are illustrated by using emission factors to develop an example annual VOC emission inventory for the U.S. In general, vegetation emits much larger quantities of VOC than does either leaf litter or water surfaces. Isoprene and various terpenes comprise the bulk of all vegetation emissions. GRA

N79-33637# Utah State Univ., Logan.
ATMOSPHERIC AND SOIL/WATER ASSESSMENT IN RELATION TO INDUSTRIAL AND RESIDENTIAL DEVELOPMENT IN SEMIARID MOUNTAIN TERRAIN: EXECUTIVE SUMMARY Final Report
Inge Dirmhirm and J. J. Jurinac Nov. 1978 25 p refs
(PB-295975/7; NSF/RA-780573) Avail: NTIS HC A02/MF A01 CSCL 13B

An air, soil, and water pollution dispersion assessment in relation to semiarid mountain terrain is presented. This assessment is valid for the part of the southwest United States that reaches

from the lower Colorado and Utah Rocky Mountains south through New Mexico, west to the Arizona and California mountainous area, to the southern part of Oregon and Idaho. GRA

N79-33638# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
AIR QUALITY DATA: THE 1977 ANNUAL STATISTICS, INCLUDING SUMMARIES WITH REFERENCE TO STANDARDS
Sep. 1978 560 p refs
(PB-295816/3; EPA-450/2-78-040) Avail: NTIS HC A24/MF A01 CSCL 13B

Comprehensive summaries of data produced by the nation's ambient air quality monitoring activities for 1977 are presented. The data are summarized in two formats: frequency distributions and status of data with reference to standards. Information is provided on the six pollutants for which National ambient air quality standards have been set: total suspended particulates, carbon monoxide, sulfur dioxide, nitrogen dioxide, total hydrocarbons, and total oxidants. GRA

N79-33639# SRI International Corp., Menlo Park, Calif.
MODELING OF STATIONARY AIR POLLUTION SOURCES IN THE CENTRAL AND WESTERN KERN COUNTY OIL FIELDS. TASK REPORT. VOLUME 1: TEXT
Patricia B. Simmon, F. L. Ludwig, and Kenneth C. Nitz Jan. 1979 117 p refs
(Contract EPA-68-01-4137)
(PB-294812/3; SRI-5258-7-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 13B

Air quality was assessed in two locations of Kern County: the oil fields in the central portion of the county, near Bakersfield, and the oil fields well to the west of Bakersfield, lying on a roughly NW to SE line about 40 miles in length, between the towns of McKittrick and Maricopa. Data describing the meteorological conditions, the measured SO2 levels, and inventories of both generator and nongenerator sources were collected and reduced. A limited verification of data detailing generator source characteristics, particularly location was performed. GRA

N79-33640# Pacific Northwest Environmental Research Lab., Corvallis, Ore.
PERFORMANCE OF AERATED LAGOONS IN NORTHERN CLIMATES Final Report
C. D. Christianson and H. J. Coutts Jan. 1979 192 p refs
(PB-295014/5; EPA-600/3-79-003) Avail: NTIS HC A09/MF A01 CSCL 13B

Cold climate aerated lagoons are evaluated. Biological processes which occur in facultative aerated lagoons are reviewed and the performance of cold climate aerated lagoons is examined. Winter and summer performance is compared, and general criteria for the design of cold climate lagoons is presented. Sample calculations for predicting the performance of aerated lagoons are discussed. GRA

N79-33641# Environmental Protection Agency, Research Triangle Park, N.C. Monitoring and Data Analysis Div.
DIRECTORY OF AIR QUALITY MONITORING SITES ACTIVE IN 1977 Annual Report
Nov. 1978 780 p refs
(PB-294963/4; EPA-450/2-78-048) Avail: NTIS HC A99/MF A01 CSCL 13B

All monitoring sites which submitted SAROAD sites identification forms and sampled at least one pollutant in 1977 are listed. Information on the pollutant sampled is included. GRA

N79-33642# Lockheed Electronics Co., Las Vegas, Nev. Remote Sensing Lab.
AERIAL RECONNAISSANCE OF HAZARDOUS SUBSTANCES SPILLS AND SPILL-THREAT CONDITIONS Final Report
H. V. Johnson Apr. 1979 73 p refs
(Contract EPA-68-03-2636)
(PB-294980/8; EPA-600/4-79-027) Avail: NTIS HC A04/MF A01 CSCL 13B

Aerial reconnaissance over a number of industrial facilities engaged in the production, storage, and handling of hazardous substances that are located near navigable waters of the United States in order to demonstrate that aerial reconnaissance procedures currently utilized in monitoring oil production, refining, and storage facilities can be applied to monitoring chemical production and storage facilities. The aerial reconnaissance procedures: (1) show whether spills and spill-threat conditions exist within chemical production and storage facilities, (2) provide annotated photographic examples of spills and spill-threat conditions exist within chemical production and storage facilities, and (3) provide annotated photographic examples of spill conditions. GRA

N79-33643# TRW, Inc., Vienna, Va. Environmental Engineering Div.
VOLATILE ORGANIC COMPOUND EMISSION INVENTORY FOR NON-ATTAINMENT AREAS IN LOUISIANA Final Report
John Dadiani, Arthur B. Nunn, III, and Thomas J. Raubacher Dec. 1978 139 p refs
(Contract EPA-68-02-2613)
(PB-294977/4; EPA-906/9-78-008) Avail: NTIS HC A07/MF A01 CSCL 13B

A volatile organic compound emission inventory was developed for non-attainment areas. The inventory consists of emissions from stationary point sources, stationary area sources, and mobile sources. Stationary point sources account most of the emissions in the Baton Rouge area. Emissions are more evenly distributed between the three categories in the New Orleans area, and mobile source emissions are predominant in the Shreveport area. The volatile organic compound emission inventory represents calendar year 1977. GRA

N79-33644# TRW, Inc., Vienna, Va. Environmental Engineering Div.
VOLATILE ORGANIC COMPOUND CONTROL STRATEGY FOR NON-ATTAINMENT AREAS IN LOUISIANA Final Report
John Dadiani, Conrad W. Petersen, and Thomas J. Raubacher Dec. 1978 68 p refs
(Contract EPA-68-02-2541)
(PB-294976/6; EPA-906/9-78-007) Avail: NTIS HC A04/MF A01 CSCL 13B

Control strategies to reduce the amount of volatile organic compounds emitted in the New Orleans, Baton Rouge, and Shreveport metropolitan areas of Louisiana are discussed. Air quality design values and a methodology for calculating the achievable emission reductions for the area are presented. The oxidant air quality design values used for the control strategy development are evaluated and five ozone transport ozone scenarios are discussed. A.W.H.

N79-33645# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
THERMAL BEHAVIOR OF NATURAL DRAFT COOLING TOWERS
J. J. Lentz 1978 333 p Sponsored in part by Md. Dept. of Health and Mental Hygiene, Baltimore, Md. Dept. of Economic and Community Development, Annapolis and Md. State Dept. of Planning, Baltimore
(PB-297557/1; PPSP/JHU/PPSE/T-11) Avail: NTIS HC A15/MF A01 CSCL 13B

Using vendor supplied performance curves, a technique was developed to use data from the design point or a single operating point of a natural draft cooling tower to calculate the evaporation, plume temperature, plume flux, and cooled water temperature at any selected off-design operating point. GRA

N79-33646# Texas A&M Univ., College Station. Ocean Engineering Program.
DILUTION OF A DENSE, VERTICAL JET IN STAGNANT HOMOGENEOUS FLUID
Ignacio Vergara May 1979 67 p refs
(Grant NOAA-04-7-158-44105)
(PB-297486/3; TAMU-SG-79-202; NOAA-79061302) Avail: NTIS HC A04/MF A01 CSCL 13B

The Federal Energy Administration (FEA) proposed to implement the Strategic Petroleum Reserve (SPR) program under the Energy Policy and Conservation Act of 1975. The most attractive option under consideration is to store the oil in

solution-mined salt cavities along the coast of the Gulf of Mexico, and to discharge the resulting brine into the sea employing a diffuser. From an environmental standpoint, a maximum allowable increase in salinity over ambient must be specified and used as a basis for diffuser design, especially under very poor disposal conditions such as exist in the absence of currents. The objective was to investigate experimentally the influence of three diffuser design parameters-port or nozzle diameter, jet velocity at the nozzle, and riser height-on the resulting brine concentration at the ocean bottom near the diffuser, under stagnant conditions. GRA

N79-33647# Health and Safety Executive, Sheffield (England).
SOURCES OF EMISSIONS OF POLYCHLORINATED BIPHENYLS INTO THE AMBIENT ATMOSPHERE AND INDOOR AIR
Kathryn E. MacLeod Mar. 1979 81 p refs
(PB-397122/4; EPA-600/4-79-022) Avail: NTIS
HC A05/MF A01 CSCL 13B

Sources of PCB in indoor and outdoor air were identified and compared. The suspected sources tested were flourescent light ballasts, landfills, electrical substations, a transformer manufacturer, and the sites of illegal dumpings. Defective light ballasts emit large quantities of PCB and are an important indoor source. Capacitors in small electrical equipment are also an important source. In general, indoor air levels of PCB were at least one order of magnitude higher than outdoor levels. The landfills and electrical substations tested are not major sources of PCB. The transformer manufacturer and the spill sites had elevated PCB levels in their immediate area, but levels 500 m away were normal for rural areas. GRA

N79-33648# National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs.
PROCEEDINGS OF A WORKSHOP ON SCIENTIFIC PROBLEMS RELATING TO OCEAN POLLUTION
Edward D. Golberg, ed. (Scripps Inst. of Oceanog., La Jolla, Calif.) Mar. 1979 229 p refs Conf. held at Estes Park, Colo., 10-14 Jul. 1978
(PB-297467/3; NOAA-79061309) Avail: NTIS
HC A11/MF A01 CSCL 13B

Ocean pollution research, development, and monitoring needs are discussed. Specific topics covered include synthetic organic compounds, chlorination products, dredging and disposal of its large volume waste, artificial radionuclides, microorganisms, trace metals, biostimulants, fossil fuel compounds, and biological effects. GRA

N79-33649# Washington State Univ., Pullman. Coll. of Engineering.
DETERMINATION OF EMISSION RATES OF HYDROCARBONS FROM INDIGENOUS SPECIES OF VETGETATION IN THE TAMPA/ST. PETERSBURG, FLORIDA AREA. TAMPA BAY AREA PHOTOCHEMICAL OXIDANT STUDY Final Report
Pat R. Zimmerman 2 Feb. 1979 174 p refs
(Contract EPA-68-02-4432)
(PB-297057/2; EPA-904/9-77-028) Avail: NTIS
HC A08/MF A01 CSCL 13B

Hydrocarbon emissions for more than 600 vegetation samples were collected and quantified chromatographically in terms of total nonmethane hydrocarbons, paraffins, olefins, aromatics, and methane. Vegetation type, amount, and distribution over the survey are was studied. Hourly emission factors were determined for each hydrocarbon component and species, and emission rates for various Florida vegetation species, associations, and land use categories are given. Natural emission during the summer months are approximately 160 metric tons per day. Isoprene, the single largest nonmethane emission component, is approximately 18% of the daily emission. The next largest nonmethane emission component, alpha-pinen, is 10% of the daily emission. GRA

N79-33650# National Technical Information Service, Springfield, Va.
AIRCRAFT AIR POLLUTION, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1977 - Jun. 1979
Diane M. Cavagnaro Jul. 1979 150 p Supersedes NTIS/PS-78/0623; NTIS/PS-77/0570; NTIS/PS-76/0529; and NTIS/PS-75/491 (NTIS/PS-79/0645/6; NTIS/PS-78/0623; NTIS/PS-77/0570; NTIS/PS-76/0529; NTIS/PS-75/491) Avail: NTIS
HC $28.00/MF $28.00 CSCL 04A

Citations include pollution control and statement, emissions data and emission factors, stratospheric pollution, effects the supersonic transport traffic have on the environment, and pollutant concentrations and movement around airports and flight corridors. One hundred and forty four abstracts, 54 of which are new entries to the previous edition are reported. GRA

N79-33651# Lamont-Doherty Geological Observatory, Palisades, N. Y.
DREDGE SPOILS AND SEWAGE SLUDGE IN THE TRACE METAL BUDGET OF ESTUARINE AND COASTAL WATERS Final Report
H. James Simpson May 1979 224 p refs
(Grant EPA-R-803113)
(PB-295711/6; EPA-600/3-79-029) Avail: NTIS
HC A10/MF A01 CSCL 13B

Radiocarbon measurements indicate the predominant source of organic carbon in New York harbor sediments is recent sewage and not petroleum hydrocarbon contamination. A new enzymatic technique was developed to trace the distribution of cellulose, a significant component of sewage sludge, in coastal sediments. Radon-222, a natural radioactive gas dissolved in the Hudson, is supplied primarily from the sediments at approximately twice the rate predicted by molecular diffusion. The behavior of phosphate and trace metals derived from sewage was examined on the basis of field data and the use of simple models to examine management alternatives. GRA

N79-33652# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
COMPILATION OF AIR POLLUTANT EMISSION FACTORS, THIRD EDITION, SUPPLEMENT NO. 9
Mar. 1979 105 p refs
(PB-295614/2; AP-42-ED-3-SUPPL-9) Avail: NTIS
HC A06/MF A01 CSCL 13B

One of the most useful (and logical) tools for estimating typical emissions is the 'emission factor,' which is an estimate of the rate at which a pollutant is released to the atmosphere as a result of some activity, such as combustion or industrial production, divided by the level of that activity. In most cases, these factors are simply given as statistical or estimated averages; that is, no empirical information on the various process parameters (temperature, reactant concentrations, etc.) is considered in their calculation. However, for a few cases, such as in the estimation of hydrocarbon emissions from petroleum storage tanks, precise empirical formulas relating emissions to such variables as tank diameter, liquid storage temperature, and wind velocity were developed. GRA

N79-33653# Pan American Univ., Edinburg, Tex.
ATTITUDES TOWARD ENVIRONMENTAL QUALITY: AREA, ETHNICITY AND SES Final Report
Jerry L. Polinard Feb. 1979 129 p refs
(Contract EPA-68-01-2683)
(PB-295496/4; EPA-600/5-79-004) Avail: NTIS
HC A07/MF A01 CSCL 13B

Analysis of an attitude study towards environmental quality shows that: (1) there is a significant relationship between environmental attitude and area, ethnicity, and a person's economic and educational status (SES); (2) concern with environmental quality and problems is greater among inner-city respondents than suburban respondents; (3) Mexican-Americans rank environmental concerns higher than Anglos no matter where they live although Anglos are more aware of and active in organizations the focus on the environment; and (4) high SES respondents were more aware of environmental problems and more actively involved in environmental organizations than middle or low SES respondents. GRA

N79-33654# KVB, Inc., Minneapolis, Minn.
FIELD TESTS OF INDUSTRIAL STOKER COAL FIRED BOILERS FOR EMISSION CONTROL AND EFFICIENCY IMPROVEMENT, SITE B Final Report, Dec. 1977 - Mar. 1978

J. E. Gabrielson, P. L. Langsjoen, and T. C. Kosvic Apr. 1979 113 p
(Contract EF-77-C-01-2609)
(PB-295535/9) Avail: NTIS HC A06/MF A01 CSCL 13B

The results of field measurements made on a 200,000 lb/hr spreader stoker boiler were given. The effect of various parameters on boiler emissions and efficiency was studied. Parameters studied included overfire air, flyash reinjection, excess air, boiler load, and fuel properties. Measurements included gaseous emissions, particulate emissions, particle size distribution of the flyash, and combustible content of the ash. Gaseous emissions measured were O2, CO2, CO, NO,SO2, and SO3 in the flue gas. Sample locations included the boiler outlet, multiclone outlet, and electrostatic precipitator outlet. In addition to test results and observations, the facility tested coals fired, test equipment, and procedures are presented. GRA

N79-33655# Rhode Island Univ., Kingston.
STUDIES ON THE BIOLOGICAL REGENERATION OF ACTIVATED CARBON M.S. Thesis
Gilbert Houston 1978 48 p refs Sponsored by Office of Water Research Technology
(PB-296526/7; W79-07005; OWRT-A-063-RI(2)) Avail: NTIS HC A03/MF A01 CSCL 07D

Research is reported on the regeneration of activated carbon exhausted by microorganisms. The absorption capacity of regenerated carbon previously exhausted with glucose was comparable to that of virgin carbon; the absorption capacity of carbon previously exhausted with the alkanes was reduced about 66%. The reduced adsorption capacity may be due to metabolic end products and/or cells of the regenerating organism. The adsorbed hydrocarbon, being more firmly bound, may account for slower regeneration and growth of the organism in closer contact with the carbon. In the glucose-E. coli system, growth characteristics and the fully regenerated adsorption capacity suggest that as glucose is utilized, the less firmly bound nutrient is made available for growth in the liquid medium. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N79-33656 Texas Univ. at Austin.
METALLIC IONS IN THE UPPER ATMOSPHERE Ph.D. Thesis
Shiv Kumar 1979 161 p
Avail: Univ. Microfilms Order No. 7919842

The global distribution of metallic ions and variations relating to changes in season, local time magnetic activity, etc., which require satellite data, were largely unexamined. A few aspects of this missing global distribution over an altitude range of 100 to 1000 km are presented, using the data from AE-C, AE-D and OGO-6 satellites and the rocket flights 18.117 and 18.118 from Wallops Island on July 12 and 13, 1971. The rocket data provide a day-night pair of vertical profiles that include altitudes not covered by the satellites. Results are presented for Mg(+), Al(+), Si(+) and Fe(+) ions in terms of their detection probabilities, median concentrations and relative abundances with respect to Mg(+) ions as a function of significant geophysical parameters. Dissert. Abstr.

N79-33657 Rice Univ., Houston, Tex.
DOPPLER LINE PROFILES IN A PLANETARY CORONA: AN EXTENDED APPROACH Ph.D. Thesis
Robert Anthony Prisco 1979 87 p
Avail: Univ. Microfilms Order No. 7919621

The question as how to best describe a satellite population is discussed. The perturbation to the reduction factor by charge exchange among the ballistic and escaping population was found negligible. The OGO-5 data was reproduced satisfactorily by introducing a satellite population characterized by lambda sub cs = 1.5 and a temperature which equals the neutral temperature beyond about 6 R sub c but increases inward to about 1.2 times the neutral temperature at 2 R sub c. It was argued that the radiation pressure effects are symmetrical and hence are unlikely to be the cause of the observed asymmetry. Dissert. Abstr.

N79-33658 California Univ., Los Angeles.
THE ROLE OF ADIABATIC CONVECTION ON THE EVOLUTION OF THE PARTICLE DISTRIBUTION FUNCTION AND ON ION CYCLOTRON WAVE GROWTH IN THE EARTH'S MAGNETOSPHERE Ph.D. Thesis
Stanley Martin Kaye 1979 253 p
Avail: Univ. Microfilms Order No. 7921424

The morphology and consequences of the cross magnetospheric electric field are studied. The convection electric field is shown empirically to be partially shielded from the inner magnetosphere. The combination of particle drifts produced by the convection and corotation electric fields and magnetic forces results in steady state spatial boundaries which limit the access of particles to certain regions of space. The earth's magnetic field is assumed to be dipolar, and approximations to the boundaries as functions of particle first and second invariant or particle energy and pitch angle are derived. The formulae derived are applied to explain one type of injection event observed aboard synchronous spacecraft. A model which includes realistic initial conditions and time dependent convection is used to explain typical substorm and non substorm associated electron injection events. Dissert. Abstr.

N79-33659 Colorado Univ. at Boulder.
NITRIC OXIDE DELTA BAND ABSORPTION MEASUREMENTS IN THE LOWER THERMOSPHERE Ph.D. Thesis
Steven Thomas Massie 1979 203 p
Avail: Univ. Microfilms Order No. 7923264

The first successful absorption measurements of nitric oxide in the earth's atmosphere were made using the high-resolution ultraviolet spectrometers on Orbiting Solar Observatory 8. These measurements were conducted between January and August, 1977, and 30 deg north and south latitude. The nitric oxide absorption data, at the (1,0) delta band wavelength of 1829.41 A, are numerically inverted to produce nitric oxide density profiles between 85 and 145 km. The major finding of the observations is that for altitudes below 95 km there is more nitric oxide at sunrise than at sunset. Between 95 and 145 km altitude, the sunrise and sunset densities are approximately equivalent. Dissert. Abstr.

N79-33660 Colorado Univ. at Boulder.
GENERATION AND CHARACTERISTICS OF JET-STREAM ASSOCIATED GRAVITY WAVES Ph.D. Thesis
John Russell Grant 1979 162 p
Avail: Univ. Microfilms Order No. 7923241

An observational and theoretical study of three gravity wave events occurring on a strong atmospheric jet-stream flow is presented. These waves were observed by a Doppler radar and a microbarograph array, from whose records a variety of features of the wave may be extracted. These features include the wave kinematic parameters (phase speed, period, wavelength, and growth rate), wave pressure amplitude at the ground, and height variation of wave velocity amplitude and phase. Several of these features suggest that the waves arose from dynamic instability of the jet flow. Consequently, the theoretical/numerical model of these events is based on linear stability theory. These comparisons show that the theory may accurately describe many of the observed wave features to the resolution of the observations. In particular, the results support the hypothesis that these waves were generated by dynamic instability of the atmospheric jet-stream. Dissert. Abstr.

N79-33661 Texas Univ. at Dallas.
A QUANTITATIVE CALCULATION OF THE CHARGE-EXCHANGE-INDUCED ATOMIC HYDROGEN ESCAPE FLUX Ph.D. Thesis
Louis Joseph Maher, Jr. 1979 110 p
Avail: Univ. Microfilms Order No. 7919843

Measurements of the ion and electron concentration and temperature from the ISIS 2 polar-orbiting spacecraft and the Arecibo incoherent backscatter radar were used to construct ion

and electron concentration and temperature profiles along magnetic field lines under equinox conditions. The neutral hydrogen escape fluxes due to charge exchange between hot thermal protons on one hand and atomic hydrogen and oxygen on the other were calculated as a function of plasmaspheric position, time of day, and solar activity. Flux was found to increase as the absolute value of the dipole latitute decreased, reaching its maximum value at the magnetic equator. The contribution of charge exchange to the total flux, the variation of the production of escaping hydrogen with altitude, and the effect of hot hydrogen upon the neutral temperature are discussed. Dissert. Abstr.

N79-33662# National Oceanic and Atmospheric Administration, Boulder, Colo. Atmospheric Physics and Chemistry Lab.
ON THE NUMERICAL SIMULATION OF AIRFLOW AND CLOUDS OVER MOUNTAINOUS TERRAIN
E. C. Nickerson 1979 19 p refs Repr. from Atmos. Phys. (West Germany), v. 52, no. 3, Aug. 1979 p 161-178
Copyright. Avail: Issuing Activity

A mesoscale model was designed with the capability of simulating moist, nonprecipitating flow over mountainous terrain. The model makes use of a transformed sigma coordinate system to increase the vertical resolution in the planetary boundary layer. A preliminary evaluation of the performace of the model was obtained from simulations of airflow and orographically induced cloud cover over the island of Hawaii. G.Y.

N79-33663 California Inst. of Tech., Pasadena.
CEDAR: AN APPROACH TO THE COMPUTER AUTOMATION OF SHORT-PERIOD LOCAL SEISMIC NETWORKS, 1. SEISMOTECTONICS OF THE IMPERIAL VALLEY OF SOUTHERN CALIFORNIA Ph.D. Thesis
Carl Edward Johnson 1979 343 p
Avail: Univ. Microfilms Order No. 7922049

A real time detection and recording system (CEDAR) was developed as a means of automating the acquistion and processing of data from short period local networks. This system was used for the past two years for the analysis of data from 150 stations in Southern California with an annual workload of about 7500 local events. Two minicomputers were used with one dedicated to the real time detection and digital recording of local earthquakes while the other is used for timing, location, and data archiving based on interactive graphical techniques. The nature of earthquake swarms in the Imperial Valley was also investigated with the goal of placing specific constraints on the physical mechanisms governing their behavior. Dissert. Abstr.

N79-33664 Colorado School of Mines, Golden.
MODAL ANALYSIS OF SEISMIC GUIDED WAVES IN COAL SEAMS Ph.D. Thesis
Steven Douglas Peterson 1978 127 p
Avail: Univ. Microfilms Order No. 7918309

The propagation and dispersion of seismic waves within coal are analyzed to determine the properties of coal and the character of its seams using a modal wave theory. Dissert. Abstr.

N79-33665 Colorado Univ. at Boulder.
AN INVESTIGATION OF TEMPORAL P-VELOCITY VARIATION USING TRAVEL TIME RESIDUALS AT HAWAII AND SELECTED CIRCUM-PACIFIC SITES Ph.D. Thesis
Archibald Currie Johnston 1979 258 p
Avail: Univ. Microfilms Order No. 7923253

The search for evidence of P-wave slowdowns by means of timing seismic signals through suspected earthquake preparatory zones is presented. Reliable techniques of sufficient sensitivity to resolve 0.1-0.2 second travel time changes in the earth are obtained since this is the likely magnitude for an earthquake precursor. Dissert. Abstr.

N79-33666 Pennsylvania State Univ., University Park.
HIGH-TEMPERATURE MECHANICAL PROPERTIES OF BASALT Ph.D. Thesis
Michael Patrick Ryan 1979 593 p
Avail: Univ. Microfilms Order No. 7922341

The concept of an incremental and cyclic thermal-stress-induced fracture mechanism in subsolidus cooling basalt is introduced. Observations of striations on the fracture surface permit a coupled model of fracture lance formation and polygon kinematics during the cyclic advances of a cracking front. The dynamic Young's modulus and the dynamic shear modulus of olivine tholeiite were measured to 865 C and 800 C respectively. Thermal expansion correction factors were determined as a function of temperature for the same olivine tholeiite. A marked change in slope at 998 K suggests that grain boundary relaxation and sliding occur. This suggests that viscous flow processes in intercrystalline glass at the glass transition itself are the crack tip blunting, striation producing mechanisms, and that advancing cracks stop and generate striations when they kinetically pierce the T sub g interval. Dissert. Abstr.

N79-33667 California Univ., San Diego.
CONSTRAINTS ON EARTH STRUCTURE DETERMINED FROM OBSERVATIONS OF MULTIPLE ScS Ph.D. Thesis
Stuart Allan Sipkin 1979 237 p
Avail: Univ. Microfilms Order No. 7921498

The spectral stacking procedure was applied to digitally recorded seismograms representing a variety of tectonic provinces. In general, young oceanic regions such as the eastern Pacific are characterized by low values of Q sub ScS (less than 130), whereas continental terrains are characterized by high values (greater than 180). It was concluded that, in the HGLP band, Q sub ScS for the average earth has a value similar to that in the western Pacific. These estimates indicate that the apparent Q sub ScS can be corrected with surface tectonic features as well as ScS travel time residuals. Synthetic seismograms computed by normal mode summation and propagator-matrix methods demonstrate that these results are not significantly biased by the source radiation patterns or by frequency dependent wave propagation effects. Dissert. Abstr.

N79-33668 California Univ., Los Angeles.
STUDIES OF FIELD EQUATIONS IN THE KERR-SCHILD METRIC Ph.D. Thesis
Stewart Alan Einstein 1979 83 p
Avail: Univ. Microfilms Order No. 7921390

The Kerr-Schild metric was derived and analyzed from several points of view. In a region of spacetime described by a Kerr-Schild metric, the gravitational field equations defined a field of O(3) matrices of which the Kerr-Schild vector field was an eigenvector. Solving the matrix equations lead to the Kerr metric. It is shown that rescaling the Kerr-Schild vector leads to a variety of other metrics including the Kerr-Newman solution. By examining the spin representation of these rotations, it is shown how the gravitational field equations define a spinor field, which is then related to special solutions of the massless Dirac equation in the Kerr-Newman space. A completely new derivation of the Newman-Penrose coefficients for a Kerr-Schild space is also presented. Dissert. Abstr.

N79-33669 State Univ. of New York at Stony Brook.
INVESTIGATIONS IN SUPERGRAVITY THEORY Ph.D. Thesis
Mark Steven Fischler 1979 71 p
Avail: Univ. Microfilms Order No. 7923461

A variety of theories exhibiting local supersymmetry is construct d. Among these are super-QED, a family of interacting scalar models, and self-dual O(4) matter coupled to O(4) extended supergravity. Spontaneous symmetry breaking is examined in some models. The O(4) through O(8) extended supergravity theories are, via explicit calculation, one-loop finite. Spinor indices are affixed to local scalar multiplets, and necessary conditions for this local extension are examined. Dissert. Abstr.

N79-33670*# San Jose State Coll., Calif. Dept. of Meteorology.
THEORETICAL STUDIES OF THE TRANSPORT AND REMOVAL PROCESSES OF SAHARA DUST Final Report, 1 Apr. - 30 Sep. 1979
In Young Lee and Robert D. Bornstein 30 Sep. 1979 17 p refs Sponsored by NASA
(NASA-CR-162332) Avail: NTIS HC A02/MF A01 CSCL 04A

The processes controlling the evolution of aerosol particles may be divided into dynamic processes concerned with the motions of air currents and microphysical processes concerned with the growth of the individual particles. The Ames planetary

boundary layer model was modified to construct a subsynoptic scale aerosol model to study the long term fate of the Saharan dust. The transport model consists of a mixed layer, a convection layer, and free atmosphere. Conditions used for a preliminary test run and results obtained are described. A.R.H.

N79-33671*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A STUDY OF INNER ZONE ELECTRON DATA AND THEIR COMPARISON WITH TRAPPED RADIATION MODELS

Michael J. Teague, Norman J. Schofield, King W. Chan, and James I. Vette Aug. 1979 214 p refs

(NASA-TM-80506; NSSDC/WDC-A-R/S-79-06) Avail: NTIS HC A10/MF A01 CSCL 04A

A summary and intercomparison of recent inner radiation zone electron data are presented. The morphology of the inner radiation zone is described and the data compared with the current generation of inner zone trapped electron models. An analytic representation of the inner zone equatorial pitch angle distribution is presented. This model was based upon data from eight satellites and was used to reduce all data to the form of equatorial flux. Although no Starfish-free high energy electron measurements were available from the inner portion of the inner radiation zone, it was found that the AE-6 model provided a good description of the present solar maximum environment. R.E.S.

N79-33672*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

LIGHTNING DETECTION AND RANGING SYSTEM LDAR SYSTEM DESCRIPTION AND PERFORMANCE OBJECTIVES

Horst A. Poehler (RCA Service Co.) and Carl L. Lennon 20 Jun. 1979 86 p

(NASA-TM-74105) Avail: NTIS HC A05/MF A01 CSCL 04A

The instruments used at the six remote stations to measure both the time-of-arrival of the envelope of the pulsed 60 MHz to 80 MHz portion of the RF signal emitted by lightning, and the electric field waveforms are described as well as the two methods of transmitting the signal to the central station. Other topics discussed include data processing, recording, and reduction techniques and the software used for the 2100S, 2114, and 2116 computers. A.R.H.

N79-33673*# California Inst. of Tech., Pasadena. Radiation Lab.

GRAVITATIONAL WAVES FROM ROTATING AND PRECESSING RIGID BODIES. 2: GENERAL SOLUTIONS AND COMPUTATIONALLY USEFUL FORMULAE

Mark Zimmerman Sep. 1979 14 p refs

(Grant NGR-05-002-256)

(NASA-CR-162344; OAP-577) Avail: NTIS HC A02/MF A01 CSCL 20N

The classical mechanics results for free precession which are needed in order to calculate the weak field, slow-motion, quadrupole-moment gravitational waves are reviewed. Within that formalism, algorithms are given for computing the exact gravitational power radiated and waveforms produced by arbitrary rigid-body freely-precessing sources. The dominant terms are presented in series expansions of the waveforms for the case of an almost spherical object precessing with a small wobble angle. These series expansions, which retain the precise frequency dependence of the waves, may be useful for gravitational astronomers when freely-precessing sources begin to be observed. J.M.S.

N79-33674# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DETERMINATION OF NITRIC OXIDE HEIGHT DISTRIBUTION FROM ROCKET ION COMPOSITION RESULTS AT LOW LATITUDES

M. A. Abdu and Inez S. Batista May 1979 16 p refs Revised

(INPE-1493-RPE/037) Avail: NTIS HC A02/MF A01

Ion composition results from rocket measurements in the D and E region were analyzed using presently known complete ion chemistry schemes to determine the distribution of nitric oxide in this height region. The method of analysis uses, as input, an atmospheric model and the ion production rates due to X-rays, and yields the height distribution of nitric oxide and production rates of the major initial ions NO(+) (for a given Lyman alpha flux) and O2(+). Analyses were carried out for Cassino, Brazil, a southern temperate latitude station and for Thumba, India, a northern low latitude station. The results are compared with available nitric oxide distributions from the NO gamma band measurements. The role of mesospheric water vapor and temperature on the deduced D region NO distribution is discussed. R.E.S.

N79-33675# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

ANGULAR DISLOCATION OF THE EARTH PRINCIPAL AXES OF INERTIA

Wilson C. C. Silva, H. U. Pilchowski, and L. D. D. Ferreira Jul. 1979 16 p refs Revised

(INPE-1508-RPE/048) Avail: NTIS HC A02/MF A01

The expression of geopotential in spherical harmonics (potential of Terrestrial Gravitational field) has two coefficients C sub 21 and S sub 21 which are taken as zero in theory (e.g., the axis of earth rotation was used as the principal axis of inertia). However, satellite measurements show that C sub 21 as well as S sub 21 are nonzero, indicating that the axis of rotation of the earth is not the principal axis of inertia. The angles by which the principal axes of inertia must be rotated in relation to the geocentric coordinate system (where the Z axis coincides with the rotating axis of the earth), the error due to using C sub 21 = S sub 21 = O, and the effect of such error in the other coefficients of the geopotential are examined.J.M.S.

N79-33676# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

IRREGULARITIES IN THE GLOBAL DISTRIBUTION OF TOTAL ELECTRON CONTENT

R. P. Kane Aug. 1979 13 p refs Revised

(INPE-1524-RPE/064) Avail: NTIS HC A02/MF A01

The day-to-day variability of daytime total electron content (TEC), at several locations, is compared to that at the midlatitude station Hamilton for quiet as well as disturbed days in 1969. It is noticed that all these changes are seldom parallel. Sometimes, large north-south gradients are noticed while, at other times, TEC seems to pile up on either side (latitudinally) of Hamilton. On some occasions, TEC in the Southern Hemisphere midlatitude is smaller than that at Hamilton for several consecutive days. It is concluded that TEC changes, at different latitudes, are neither parallel nor antiparallel in any consistent way and large scale random movements and/or long lasting TEC changes, probably due to height variations, are indicated. If all these are due to neutral winds, large scale vagaries of neutral winds during quiet as well as disturbed periods are indicated. Author

N79-33677# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

EQUATORIAL ENHANCEMENT OF DP2 FLUCTUATIONS

R. P. Kane (Phys. Res. Lab. Ahmedabad, India) and N. B. Trivedi Jul. 1979 16 p refs Revised

(INPE-1519-RPE/055) Avail: NTIS HC A07/MF A01

The fluctuations of geomagnetic H at the equatorial location Huancayo and the low latitude location Fuquene at the same longitude were compared during two DP-2 events. It was seen that, in contrast to the usual belief that these fluctuations are enhanced in the electrojet region in the same as the enhancement of normal Sq, the fluctuations were either abnormally enhanced or erratic in the early morning hours. Thus, some other factors besides the electrojet current strength (probably peculiar irregularities) seem to be involved in causing these equatorial enhancements. Author

N79-33678# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MESOSPHERIC OZONE FROM MEASUREMENTS OF GROUND BASED SODIUM SOUNDERS

V. W. J. H. Kirchhoff, B. R. Clemesha, and D. M. Simonich May 1979 14 p refs Revised Sponsored in part by Fundo Nacional de Desenvolvimento Cientifico e Technologico, Brazil

(INPE-1495-RPE/039) Avail: NTIS HC A02/MF A01

Mesospheric sodium was monitored from the ground by simultaneous observations of the neutral sodium densities and the sodium glow intensity. (The first parameter was measured by laser radar and the second by a tilting filter photometer.) Based on the Na photochemistry the ratio intensity/abundance is proportional to the ozone density close to the height of peak sodium emission (89 km). Using a two year set of sodium data, taken at Sao Jose dos Campos (23 deg S, 46 deg W) a number of features of the ozone density variations were determined. The average nocturnal behavior is one of constant ozone density, and a strong peak in ozone concentration is observed in autumn. The results also imply that the reaction rate for Na + O3 yields NaO + O2 must be larger than the usually quoted value of 6.5 x 10 to the minus 12th power cu cm/sec. R.E.S.

N79-33679# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DISTURBANCES IN THE NOCTURNAL THERMOSPHERE AND OF ITS PHASE VELOCITIES IN THE CENTER OF A BRAZILIAN GEOMAGNETIC ANOMALY [PERTURBACOES NA TERMOSFERA NOTURNA E SUAS VELOCIDA DES DE FASE NO CENTRO DA ANOMALI GEOMAGNETIC BRASILEIRA]

J. H. A. Sobral, M. A. Abdu, I. S. Batista, Y. Sahai, and C. J. Zamlutti Jul. 1979 12 p refs In PORTUGUESE Revised
(INPE-1531-RPE/063) Avail: NTIS HC A02/MF A01

Recent data of the nocturnal emission of OI 6300A and the ionosondes revealed interesting thermospheric perturbations in the form of wave propagation along the geomagnetic meridian. The sweep measurements of the spectra at 6300A were used to determine the apparent mid velocity of the phases of the 'peaks' and 'valleys' of the spatial distribution of the emission with values in the order of 200-300 m/s. Those perturbations were the first to be detected in that region. Their possible causes are discussed. Transl. by M.M.M.

N79-33680# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

NITROUS OXIDE CONCENTRATION AND IONIC PRODUCTION RATE IN THE LOWER IONOSPHERE AS DETERMINED BY THE IONIC COMPOSITION DATA OBTAINED FROM A ROCKET [CONCENTRACAO DE OXIDO NITROSO E TAXA DE PRODUCAO IONICA NA BAIXA IONOSFERA, DETERMINDAS USANDO DADOS DE COMPOSICAO IONICA OBTIDOS COM FOGUETES]

Inez S. Batista Jul. 1979 17 p refs In PORTUGUESE Presented at the 31st Reuniao Anual da Soc. Brasil. para o Progr. da Cienc. (SBPC), 11-18 Jul. 1979 Revised
(INPE-1525-RPE/059) Avail: NTIS HC A02/MF A01

A method is presented to determine the concentration profiles of nitrous oxide and the rate of production in the D and E regions of the undisturbed ionosphere, at mid and low latitudes using ionic composition data obtained from rockets. The method consists of a complete chemical outline for the regions involved and the continuity equations for each individual ionic species. An atmospheric model and the alpha Lyman solar spectra were the parameters used since the ionic production rate is influenced by the X-rays. The influence of water vapor and the mesospheric temperature on the distribution of nitrous oxide in the ionospheric region is demonstrated.
Transl. by M.M.M.

N79-33681# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

NUMERICAL SIMULATION OF THE LOCAL PROPERTIES OF THE ATMOSPHERE [SIMULACAO NUMERICA DE PROPRIEDADES LOCAIS DA ATMOSFERA]

Ricardo Negreiros DePaiva Jul. 1979 9 p refs In PORTUGUESE; ENGLISH summary
(INPE-1510-RPE/059) Avail: NTIS HC A02/MF A01

A description of the subroutine ATDENS is presented which, using a numerical procedure, gives approximate values for the density, mean molecular weight, and local temperature of the atmosphere. The subroutine ATDENS is the coding of Roberts' analytical procedure based upon Jacchia's atmospheric model (including Jacchia's modifications). The use of the subroutine gives the elements needed for the computation of the drag coefficient and drag accelerations. R.E.S.

N79-33682# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

A PROGRAM FOR THE REDUCTION OF IONOGRAMS: ANALYSIS OF THE IONOSPHERIC BEHAVIOR OVER CACHOEIRA PAULISTA DURING MAGNETIC STORMS M.S. Thesis [PROGRAMA PARA REDUCAO DE IONOGRAMAS: ANALISE DO COMPORTAMENTO IONOSFERICO SOBRE CACHOEIRA PAULISTA DURANTE TEMPESTADES MAGNETICAS]

Alan Carlos Giese Jul. 1979 115 p refs In PORTUGUESE; ENGLISH summary
(INPE-1522-TDL/011) Avail: NTIS HC A06/MF A01

One of the primary objectives of this work is the development of a detailed computer program for true height analyses of ionograms, with sufficient sophistication, so that the error in the determined true heights is reasonably small. The details of the program and its execution are described. It is then intended to undertake a study of ionospheric response to magnetic storms, over Cachoeira Paulista (22 deg 42 min S, 45 deg 01 min W), using true height analyses of the ionograms, during magnetic disturbances. Thus, study of magnetic storms, using true height analyses, forms the scientific goal of the work. G.Y.

N79-33683*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PROPOSED SATELLITE LASER RANGING AND VERY LONG BASELINE INTERFEROMETRY SITES FOR CRUSTAL DYNAMICS INVESTIGATIONS

P. D. Lowman, R. J. Allenby, and H. V. Frey Sep. 1979 71 p refs
(NASA-TM-80563; Rept-922) Avail: NTIS HC A04/MF A01 CSCL 08G

Recommendations are presented for a global network of 125 sites for geodetic measurements by satellite laser ranging and very long baseline interferometry. The sites were proposed on the basis of existing facilities and scientific value for investigation of crustal dynamics as related to earthquake hazards. Tectonic problems are discussed for North America peripheral regions and for the world. The sites are presented in tables and maps, with bibliographic references. R.E.S.

N79-33684*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

POSTSEISMIC VISCOELASTIC DEFORMATION AND STRESS. PART 2: STRESS THEORY AND COMPUTATION; DEPENDENCE OF DISPLACEMENT, STRAIN, AND STRESS ON FAULT PARAMETERS

Steven C. Cohen Aug. 1979 19 p refs
(NASA-TM-80334) Avail: NTIS HC A02/MF A01 CSCL 08K

A viscoelastic model for deformation and stress associated with earthquakes is reported. The model consists of a rectangular dislocation (strike slip fault) in a viscoelastic layer (lithosphere) lying over a viscoelastic half space (asthenosphere). The time dependent surface stresses are analyzed. The model predicts that near the fault a significant fraction of the stress that was reduced during the earthquake is recovered by viscoelastic softening of the lithosphere. By contrast, the strain shows very little change near the fault. The model also predicts that the stress changes associated with asthenospheric flow extend over a broader region than those associated with lithospheric relaxation even though the peak value is less. The dependence of the displacements, stresses on fault parameters studied. Peak values of strain and stress drop increase with increasing fault height and decrease with fault depth. Under many circumstances postseismic strains and stresses show an increase with decreasing depth to the lithosphere-asthenosphere boundary. Values of the strain and stress at distant points from the fault increase with fault area but are relatively insensitive to fault depth. K.L.

N79-33685*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MULTIVARIATE APPROXIMATION METHODS AND APPLICATIONS TO GEOPHYSICS AND GEODESY

Marie-Jeanne Munteanu Aug. 1979 40 p refs

Submitted for publication
(NASA-TM-79679) Avail: NTIS HC A03/MF A01 CSCL 08G

The first report in a series is presented which is intended to be written by the author with the purpose of treating a class of approximation methods of functions in one and several variables and ways of applying them to geophysics and geodesy. The first report is divided in three parts and is devoted to the presentation of the mathematical theory and formulas. Various optimal ways of representing functions in one and several variables and the associated error when information is had about the function such as satellite data of different kinds are discussed. The framework chosen is Hilbert spaces. Experiments were performed on satellite altimeter data and on satellite to satellite tracking data. G.Y.

N79-33686# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
RESEARCH IN SEISMOLOGY Semiannual Report, 1 Oct. 1978 - 31 Mar. 1979
Otto W. Nuttli and Brian J. Mitchell 23 Apr. 1979 83 p refs
(Contract F49620-79-C-0025; ARPA Order 3291)
(AD-A070015; AFOSR-79-0692TR; SAR-1) Avail: NTIS HC A05/MF A01 CSCL 08/11

Five articles are presented which used data from short period seismograms to study the excitation and attenuation of 1 Hz crustal phases (P, Pg, Sn and Lg) in southern Asia. The data show that the attenuation in southern Asia varies laterally, but that in general it is less than in Iran and the western United States, and greater than in eastern North America and central Asia. The most severe attenuation occurs in northern India, northern Pakistan and Afghanistan, where it is comparable to the values found for Iran and the western United States. R.E.S.

N79-33687# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
A STUDY OF THE SPATIAL AND TEMPORAL VARIATION OF TEMPERATURE IN THE ATMOSPHERIC BOUNDARY LAYER Final Report
James E. Tillman 15 Jun. 1979 51 p
(Grant DAHC04-74-G-0022)
(AD-A071760; ARO-11586.1-EN) Avail: NTIS HC A04/MF A01 CSCL 04/1

The horizontal uniformity of minimum temperature during quiescent intervals for unstable convection is shown to be on the order of a few hundreds of a degree celsius over a fifty meter array for periods on the order of fifteen minutes. One interpretation of this characteristic is that the minimum temperature during the quiescent interval is characteristic of the potential temperature at planetary boundary layer heights at which the potential temperature is constant with height. Examination of the quiescent temperature during unstable and stable periods of the same day, shows that the spatially uniform quiescent temperatures go from cold during unstable conditions to warm during stable conditions. The latter is consistent with the hypothesis that elements from height ranges of uniform potential temperature are advected into the surface layer by mechanical mixing during these stable conditions. GRA

N79-33688# Utah State Univ., Logan. Space Science Lab.
ROCKET MEASUREMENTS OF AURORAL ELECTRON DENSITY IRREGULARITIES IN SUPPORT OF THE DEFENSE NUCLEAR AGENCY WIDEBAND SATELLITE Progress Report, 15 Mar. 1976 - 31 Aug. 1978
K. D. Baker, J. C. Ulwick, M. C. Kelley, L. C. Howlett, and N. Grossbard 31 Aug. 1978 73 p refs
(Contract DNA001-76-C-0256)
(AD-A071323; AD-E300536; DNA-4676T) Avail: NTIS HC A04/MF A01 CSCL 04/1

In situ measurements of electron density irregularities in the auroral E and F regions were conducted in support of the DNA Wideband satellite. The results from the two rocket probes that were flown in conjunction with nighttime overpasses of the satellite are reported in detail. Significant regions of irregular plasma density fluctuations were detected on both flights, but with somewhat different character and over different spatial regions. The spectra of the irregularities indicate that they are formed by different mechanisms than those observed in both spread F and in barium clouds. GRA

N79-33689# SRI International Corp., Menlo Park, Calif.
SCINTILLATION STRUCTURE IN A SEVERELY DISTURBED SCATTERING ENVIRONMENT Progress Report, 1 Nov. 1977 - 30 Sep. 1978
Charles L. Rhino Oct. 1978 38 p refs
(Contract DNA001-77-C-0038)
(AD-A071321; AD-E300532; DNA-4732T) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report presents a complete treatment of the second-order statistics of intensity under conditions of strong scattering. A three-dimensional powerlaw striation model is used in the analysis. For completeness, the special forms for a strictly two-dimensional medium are also derived. Asymptotic formulas for the fade coherence time are derived. Simple asymptotic results can be derived only for three-dimensional spectral indices less than 4. However, naturally occurring striations seem to fall in this range, and the simple formulas are generally applicable. GRA

N79-33690# Naval Ocean Systems Center, San Diego, Calif.
PROCEEDINGS OF CONFERENCE ON ATMOSPHERIC EFFECTS ASSESSMENT Progress Report, May 1973 - Jan. 1979
Juergen H. Richter 15 Jun. 1979 161 p Conf. held at San Diego, Calif., 23-25 Jan. 1979
(AD-A071781; NOSC/TD-260) Avail: NTIS HC A08/MF A01 CSCL 04/1

Twenty-three papers presented at the conference on atmospheric refractive effects assessment are reproduced. The papers cover the areas of Naval operations and refractive effects assessment systems; refractive effects modeling; refractivity measurement techniques and propagation measurements; and refractivity forecasting and climatologies. GRA

N79-33691# Mission Research Corp., Santa Barbara, Calif.
MEASUREMENT OF ELECTRON ATTACHMENT AND MOBILITY IN DRY AND WET AIR Progress Report, Jul. - Dec. 1978
Melvin L. Price and Victor A. J. VanLint Dec. 1978 67 p refs
(Contract DNA001-78-C-0141)
(AD-A071333; AD-E300541; MRC/SD-R-31; DNA-4788T)
Avail: NTIS HC A04/MF A01 CSCL 04/1

The experiments described in this report measured electron attachment and mobility in air as a function of electric field and water vapor partial pressure. The relevant rates were inferred from measurements of the current across a parallel plate ionization chamber to a short pulse of ionizing radiation. GRA

N79-33692# University of Southern California, Los Angeles. Geophysical Lab.
A SURFACE WAVE DISPERSION STUDY OF THE CRUSTAL AND MANTLE STRUCTURE OF CHINA Interim Report
Ira Pines, Ta-Liang Teng, Robert Rosenthal, and Shelton Alexander May 1979 75 p refs Prepared in cooperation with Penn. State Univ., Univ. Park, Dept. of Geoscience
(Contract F49620-76-C-0010; ARPA Order 34291)
(AD-A070014; AFOSR-79-0688TR; TR-79-2) Avail: NTIS HC A04/MF A01 CSCL 08/11

Repeated surface wave group velocity measurements over the same paths were made by using large aftershocks of several great (M greater than 7) earthquakes recently occurring in China. Multiple filter technique was applied to the properly rotated three-component digital data from Seismological Research Observatory (SRO) stations, so that both Rayleigh- and Love-wave dispersion data were obtained over a number of paths crossing various tectonic provinces of China. In several cases, higher mode data were also derived. An estimate of uncertainty of these dispersion data was obtained from the repeated measurements with identical source-receiver geometry. The generalized surface wave inversion technique was applied to these multi-mode dispersion data, and crustal and upper mantle structures were derived for various tectonic provinces of China. The results clearly demonstrate that the Chinese Mainland is far from being laterally homogeneous, the lateral heterogeneities are closely related to the past tectonic developments. A particularly unusual

crustal and upper mantle structure is found underlying the Tibet plateau. GRA

N79-33693# Naval Surface Weapons Center, Dahlgren, Va.
FIVE ALGORITHMS FOR THE EARTH TIDE TERMS IN THE FORCE MODEL OF NSWC COMPUTER PROGRAMS FOR SATELLITE GEODESY Final Report
Walter Groeger Feb. 1979 78 p refs
(AD-A071092; NSWC/DL-TR-3912) Avail: NTIS HC A04/MF A01 CSCL 08/5

The most recent versions of five computer algorithms which jointly specify the gravitational action by which the tidal dislocation of the earth's masses perturbs satellite motion are presented. The first computer routine formulates the perturbing acceleration which the semidiurnal lunar component of the atmospheric tide bulge exerts on the orbit of an artificial earth satellite. The second routine augments the first by spelling out the combined effect of solar heating and solar mass attraction. The third algorithm accounts for the ocean tide. Only the semidiurnal lunar tide is presently considered, but the algorithm sets the pattern for introducing various other spectral components of the fluid tide, if desired. The algorithm starts from a table for the global tide amplitudes and phase angles. It, subsequently, approximates the gravitational potential exterior to the earth caused by the tidal bulge by that of a system of point masses located on the ocean surface. The fourth tide routine is optional: it may be used in place of the third algorithm if one wishes to base the tide potential on a functionalization of the tidal sea surface. Finally, there is a computer routine for the Newtonian attraction caused by the tide bulge of the solid earth. Both the lunar and solar tide components are included. The tidal properties are assumed to be functions of latitude. Accordingly, Love coefficients are featured that are zonal harmonic expansions of latitude.GRA

N79-33694# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
AN ELECTROMAGNETIC GEOPHYSICAL SURVEY AT AN INTERIOR ALASKA PERMAFROST EXPOSURE
P. V. Sellman, A. J. Delaney, and S. A. Arcone May 1979 10 p refs
(AD-A071065; CRREL-79-14) Avail: NTIS HC A02/MF A01 CSCL 08/14

Road construction activity near Fairbanks, Alaska, in the late fall of 1977, revealed a large exposure of Fairbanks silt containing numerous massive ice features. These exposures are typical of those found in this region. Thaw, during the summer of 1978, caused the upper ice-rich sections to retreat several meters. Geophysical techniques were utilized over these exposures to determine if resistive anomalies of ice wedge dimension could be detected. Magnetic induction measurements at three intercoil spacings and low-frequency surface impedance measurements were made about 6 m from the edge of each exposure in April 1978 before thaw commenced. The results agree well with observations of the layering, but most individual anomalies are difficult to interpret because the lateral extent of the ice is unknown. GRA

N79-33695# Boston Univ., Mass. Dept. of Astronomy.
THE INFLUENCE OF GEOMAGNETIC ACTIVITY ON THE DAY-TO-DAY VARIABILITY OF THE IONOSPHERIC F-REGION Annual Report, 1 Oct. 1977 - 30 Sep. 1978
Michael Mendillo Jan. 1979 80 p refs
(Contract F19628-77-C-0270; AF Proj. 4643)
(AD-A070966; ACBU-Ser-NO-10; AFGL-TR-79-0074; AR-1) Avail: NTIS HC A05/MF A01 CSCL 04/1

This report describes a summary of preliminary findings concerning the search for a geomagnetic activity control of ionospheric variability. The results are encouraging in that the division of a month's worth of F-region data into a geomagnetically ordered hierarchy may lead to a satisfactory forecasting scheme for day-to-day variability. The five geomagnetically quiet days of the month (QQ-days) were seen to behave in a consistent way for seasons and stations where the disturbed days had a well-defined pattern. The geomagnetic storm associated disturbed days within a month are themselves best handled by superimposed epoch derived average storm patterns for each day of a storm period. Thus, if storm days and QQ days are removed from a monthly distribution, the remaining 15-20 days may either fall within acceptable variability limits or lend themselves to 'QQ-like' 'DD-like' classifications. GRA

N79-33696# Sandia Labs., Albuquerque, N. Mex.
EVIDENCE FOR GRAVITY SCALING AND IMPLICATIONS FOR EXPLOSION CRATERS
A. J. Chabai 1979 25 p refs Presented at 6th Intern. Symp. on Mil. Appl. of Blast Simulation, Cahors, France, 25-29 Jun. 1979
(Contracts EY-76-C-04-0789; DE-AC04-76DP-00789)
(SAND-78-2045C; Conf-790609-1) Avail: NTIS HC A02/MF A01

Crater data were examined from recent hypervelocity impact and chemical explosion experiments conducted in accelerating frames. Data were identified from experiments for which the conditions of similitude were very nearly achieved. Examination of these data from similar experiments indicates that fourth-root or gravity scaling is the rule which best relates crater dimensions to the energy release of impacting projectiles or explosives. Implications for chemical and nuclear explosion cratering are that in model experiments where the gravitational field is constant the specific energy and dimensions of the explosive must be scaled as the fourth-root of explosions energy release. Additionally, medium properties must be appropriately scaled in similar experiments. Because of the impracticability of realizing the constraints imposed on model experiments by similitude requirements attention in future experiments should be focused on the sources of similarity violation and their influence on empirical relationships derived from experiments. Experiments in accelerating frames with both explosive sources and hypervelocity impact projectiles offer one means for investigating effects of similitude violation. DOE

N79-33697# Sandia Labs., Albuquerque, N. Mex. Simulation Technology Dept.
LOADING TECHNIQUE FOR DYNAMIC RESPONSE STUDIES OF GEOLOGICAL MATERIALS
R. I. Butler and M. J. Forrestal Apr. 1979 17 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0853) Avail: NTIS HC A02/MF A01

A loading technique to study the dynamic response of tuff was explored. Loading is provided by electrically exploding etched copper mesh patterns with current from a capacitor discharge. Pressure pulses with peak pressures up to 1.25 kbar and 0.10 to 0.20 ms durations were measured with a pressure bar. The upper value of peak pressure was limited by the strength of the experimental apparatus, and higher pressure generation is possible with a redesign of test hardware. DOE

N79-33698# Sandia Labs., Albuquerque, N. Mex.
ENHANCEMENT OF GEOPHYSICAL SOIL PROFILES USING INSTRUMENTAL MARINE SEDIMENT PENETRATORS
R. L. McNeill 1979 21 p refs Presented at the 11th Offshore Technol. Conf. (OTC), Houston, Tex., 30 Apr. - 3 May 1979
(Contract EY-76-C-04-0789)
(SAND-78-1841; Conf-790444-1) Avail: NTIS HC A02/MF A01

Static and dynamic penetrators measure strengths and layer thickness in soils of all strengths, to great depths in soft to medium soils. Thus, penetrators, furnish information, quickly and cheaply, to allow geophysical travel-time profiles to include strengths and layer thickness. For gas-charged soils, penetrator strength data may be the more reliable. Penetrators can also measure pore pressures and shaft friction in situ. The implantation and data analysis techniques, along with the instrument systems, are well developed. What needs to be done now is for the practicing professionals, geophysical and geotechnical, to evaluate penetrators for commercial use. DOE

N79-33699# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.
UNCERTAINTIES ASSOCIATED WITH GLOBAL EFFECTS OF ATMOSPHERIC CARBON DIOXIDE
R. M. Rotty Mar. 1979 29 p refs
(Contract EY-76-C-05-0033)
(ORAU/IEA-79-6(0)) Avail: NTIS HC A03/MF A01

Although the evidence is quite clear that the increase in atmospheric CO2 is at least to a large degree a result of fossil

fuel burning, and it is equally clear that this increase will result in some change in the global climate, there are quantitative uncertainties that require additional understanding before full assessments can be made. There are also quantitative uncertainties regarding the natural carbon cycle, the behavior of the various reservoirs when perturbed by man, the terrestrial biosphere, and the rate at which the oceans can assimilate and store carbon. There are uncertainties in regard to the climate change that can result from increased atmospheric CO2. Progress in modeling the atmosphere must continue to narrow these uncertainties before the impacts of climate change on man can be adequately determined. The future demands for fossil fuels are uncertain. The growth of the developing world will be closely linked to fossil energy for the next five to eight decades. Only the observed increase in the atmospheric concentration and the present (and recent past) rate of production of CO2 from fossil fuels provide data without uncertainties. DOE

N79-33700# National Climatic Center, Asheville, N. C.
DISTRIBUTION OF RADIOSONDE ERRORS
Harold L. Crutcher May 1979 35 p
(PB-297383/2; NOAA/TR/EDIS-32; NOAA-79061303) Avail: NTIS HC A03/MF A01 CSCL 04A

The radiosonde observing program of the National Weather Service (NWS) provides three-dimensional information on distribution of pressure, temperature, water vapor, and wind. It is part of the upper-air observational network. From 1937 to the present, NWS and the National Climatic Center (NCC) and its predecessors reviewed records and various types of errors in the radiosonde oberving program. With the system now operating a considerable number of stations under the minicomputer program, the parameters of the evolving gamma distribution have been changing. Therefore, this supplemental study has been prepared. The data used are contained in the NCC bimonthly tabulations of the 1976 Upper Air Verification Reports. New indices were prepared by summing the weighted total errors for the year and dividing by the total number of observations made during the year. The stations and annual weighted total errors are given in alphabetical order and in order of index magnitude. GRA

N79-33701# National Oceanic and Atmospheric Administration, Silver Spring, Md. Air Resources Labs.
AN ATTEMPT TO MEASURE ATMOSPHERIC OZONE WITH ULTRAVIOLET LIDAR
Ronald W. Fegley and C. Murray Penney Dec. 1978 22 p refs
(PB-296322/1; NOAA-TM-ERL-ARL-75; NOAA-79043002) Avail: NTIS HC A02/MF A01 CSCL 04A

An attempt was made to measure the profile of atmospheric ozone with an ultraviolet lidar system in 1975. Differential absorption lidar (DIAL) was used to study the concentration of the species of interest in a wavelength region of strong absorption (in this case 300 nm for ozone). The return signal was inverted to provide the 'excess absorption' as a function of height. The excess absorption can then be interpreted as a concentration profile of ozone. The experimental setup, typical data, and error analysis are discussed. Because of laser difficulties, data quality was not adequate to permit calculation of ozone profiles. Improved capability of commercial lasers makes it likely that excellent results could be obtained with a practical system from 30 km down through the troposphere. GRA

N79-33702# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Technology Div.
OMEGA WIND-ERROR ESTIMATION
Michael L. Olson Dec. 1978 116 p refs
(Grant NSF ATM-77-23757)
(PB-295624/1; NCAR/TN-131-EDD) Avail: NTIS HC A06/MF A01 CSCL 04A

The estimation of winds and their errors for Omega radiosonde soundings is addressed. Major improvements over an earlier wind error model in modeling VLF propagation for estimation of phase variances of Omega signals and the use of a smoothing improvement factor are discussed. The formulation for the phase variance estimation incorporates the distance and direction of propagation, the ground conductivity, noise level around the world, and empirical data collected at Majuro. This resulted in a extensive tabulation of Omega wind errors. Derivations of basic equations for linear mean-square estimation, are included. GRA

N79-33703# National Center for Atmospheric Research, Boulder, Colo.
OBSERVED STRUCTURE AND ENERGETICS OF TRANSIENT AND STATIONARY MOTIONS IN THE NORTHERN HEMISPHERE WINTERTIME CIRCULATION Ph.D. Thesis - Washington Univ.
Ngar-Cheung Lau Nov. 1978 202 p refs
(Grant NSF ATM-77-23757)
(PB-295620/9; NCAR-CT-50) Avail: NTIS HC A10/MF A01 CSCL 04A

The regional characteristics of midlatitude transient disturbances and their relationship with the stationary flow are studied by examining the three-dimensional structure of atmospheric circulation statistics compiled from twice-daily hemispheric analyses at 10 pressure levels (1000-100 mb) for 11 winters. The vertical structure and transport properties of transient eddies over the mid-oceans resemble those associated with mature baroclinic waves. The disturbances over the western continents acquire a more barotropic character. The structure and transport characteristics of the stationary component of the atmospheric circulation are documented, and the relative contributions of stationary and transient motions to various local, time averaged budgets are assessed. GRA

N79-33704# Transportation Research Board, Washington, D. C.
LANDSLIDES: ANALYSIS AND CONTROL
Robert L. Schuster and Raymond Krizek 1978 250 p Sponsored by the Natl. Academy of Sci.
(PB-295869/2; TRB/ISN-176; ISBN-0-309-02804-3) Avail: NTIS HC A11/MF A01 CSCL 08L

Methods of recognition of potential earth movements through remote sensing approaches and field reconnaissance are described to aid in defining the extent of the problem. The identification of the type of movement is essential to proper solution of the problem. Techniques for installing instruments and analyzing data are covered, as are methods of evaluating the strength potential of the rock and soil. Methods of determining stability requirements in order to obtain the most efficient design are described in detail. Design and construction techniques are described that will facilitate the handling of the movement problem and to avoid contributing to future movement. Rock-slope engineering is given special attention, particularly in a section on warning devices. GRA

N79-33705# Systems Control, Inc., Palo Alto, Calif.
TECHNOLOGY ASSESSMENT OF THE FLUOROCARBON/OZONE DEPLETION PROBLEM Final Report
Jan. 1979 156 p refs
(Grant NSF ERS-77-09248)
(PB-294927/9; NSF/PRA-7709248) Avail: NTIS HC A08/MF A01 CSCL 04A

Environmental and biological processes due to ozone depletion by chlorofluorocarbons are discussed. A computer based simulation model to predict the physical, biological, and economic consequences due to ozone depletion, control actions on the industries producing and using chlorofluorocarbons, and early warning systems to detect ozone depletion are discussed. The parameters specified for the computer simulation are described including the projected ozone depletion, alternative control actions, detection threshold, and chlorofluorocarbon production and release. A.W.H.

N79-33706# Saint Louis Univ., Mo. Dept. of Earth and Atmospheric Sciences.
SH: A COMPUTER PROGRAM FOR GENERATING FAR-FIELD TANGENTIAL TIME HISTORIES FOR POINT EARTHQUAKE SOURCES
Robert B. Herrmann and Chien Y. Wang Jan. 1979 116 p refs
(Grant NSF ENV-78-20875)
(PB-296455/9; NSF/RA-790035) Avail: NTIS HC A06/MF A01 CSCL 08K

A computer program is presented for the computation of far field tangential time histories due to point earthquake sources. The program provides accurate results for frequencies of 0-10 Hz

and for receiver distances from one source depth to 550 kilo meters. Comparisons are made with an independent half-space solution to test the validity of the far field assumption in representing time histories. A package of four computer programs is given. GRA

N79-33707# National Weather Service, Silver Spring, Md. Techniques Development Lab.
A SIMPLE SOIL HEAT FLUX CALCULATION FOR NUMERICAL MODELS
Wilson A. Shaffer May 1979 21 p refs
(PB-297350/1; NOAA-TM-NWS-TDL-68; NOAA-79060403)
Avail: NTIS HC A02/MF A01 CSCL 08M

An analytic solution of the heat equation is used to compute the soil heat flux needed for a surface energy balance calculation. An initial soil temperature profile and constant thermal properties are assumed. No vertical computational levels within the soil are used or needed. The scheme is inherently accurate, since it is derived from an analytic solution and is immune from the problems of spatial truncation error and numerical instability associated with finite difference techniques. Two simplifications of the scheme are presented that reduce computer storage requirements and the number of computations, allowing the scheme to be applied to models with a wide range of time steps. GRA

N79-34124*# National Aeronautics and Space Administration, Washington, D. C.
THE EARTH'S ATMOSPHERE
In its Skylab's Astron. and Space Sci. 1979 p 79-92 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N79-33708 State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
ENERGY EXCHANGE BETWEEN A SPRUCE CANOPY AND THE ATMOSPHERE Ph.D. Thesis
Gary Eugene Bertolin 1979 143 p
Avail: Univ. Microfilms Order No. 7920306

A study was made of the energy budget and turbulence within a forest canopy. Net radiation and heat flux were measured and evapotranspiration was calculated as a residual. Because Gill anemometers were used in measuring the wind velocities, a study was made to determine if the instruments were capable of recording all the significant heat flux within a canopy. A spectral analysis revealed that the turbulence in a forest canopy obeys a power law throughout the inertial subrange. The temperature spectra falls off at -5/3, but the horizontal and wind spectra follow a -7/3 slope (which may be a result of the instrumentation). The most important eddy wavelength contributing to the horizontal wind fluctuations was found to average 75 meters. It appears that turbulence in a forest canopy is generated at the top of the canopy and moves downward, with the high frequency components being selectively damped.
Dissert. Abstr.

N79-33709 Arizona Univ., Tucson.
AEROSOL EFFECTS ON CLIMATE: CALCULATIONS WITH A TIME-DEPENDENT RADIATIVE-CONVECTIVE MODEL Ph.D. Thesis
Thomas Peter Charlock 1979 190 p
Avail: Univ. Microfilms Order No. 7919128

A one dimensional, vertical energy balance model of the earth atmosphere system was constructed to solve for the temperature of the globe or a given latitude belt. The model calculates annual and monthly solutions. In the monthly case, separate heat storage is computed in oceans, land, and air. When run for globally averaged conditions the model produces temperatures very close to the standard atmosphere, except for the lower stratosphere, where model temperatures err by about 5 K. The model simulation for the latitude belt 40 to 50 degrees north departs from climatology only about 1 or 2 K each month at the surface. Aerosol changes the model shortwave (solar) and infrared (terrestrial) radiation fields. Calculations made for aerosol optical depths of zero and 0.125 show that aerosol drops the temperature of the global model by 1.5 K, that of the monthly model at midlatitudes by 1.6 K, and that of the annual midlatitude model by 1.8 K. Dissert. Abstr.

N79-33710 Colorado State Univ., Fort Collins.
DETERMINATION OF TROPICAL CYCLONE SURFACE PRESSURE AND WINDS FROM SATELLITE MICROWAVE DATA Ph.D. Thesis
Stanley Quesnel Kidder 1979 96 p
Avail: Univ. Microfilms Order No. 7923357

A new approach to the problem of deducing wind speed and pressure around tropical cyclones is presented. The technique, called 'surface wind inference from microwave data' (SWIM) technique, uses satellite microwave sounder data to measure upper tropospheric temperature anomalies which may then be related to surface pressure anomalies through the hydrostatic and radiative transfer equations. Although current satellite instruments have too coarse resolution to accurately estimate central pressure, surface pressure gradients outside of the radius of maximum wind can be estimated for the first time. Surface pressure gradients determined by the SWIM technique are related to surface wind speeds using the gradient wind equation and a shearing parameter. The method was tested using simulated satellite data constructed from temperature, pressure, and height data recorded by aircraft reconnaissance of four hurricanes.
Dissert. Abstr.

N79-33711 Ohio State Univ., Columbus.
DIFFERENTIAL REFLECTIVITY AND ITS USE IN THE RADAR MEASUREMENT OF RAINFALL Ph.D. Thesis
Hussam Hussein Al-Khatib 1979 143 p
Avail: Univ. Microfilms Order No. 7922445

Rainfall rate was measured by combining measurements of differential reflectivity (Z sub DR) and radar reflectivity at horizontal polarization. The Z sub DR results compare favorably with raingauge measurements, giving an average error of 0.4 dB for rainfall measured over an area of 1000 sq km for a 2 hr period. The Z sub DR results also had a better accuracy than values for a derived or calibrated Z-R relationship based on rainguage measurements which gave errors of 1.14 dB. An analysis of experimental errors and the results of three different radar calibrations of Z sub DR are also presented. Possible implications of the Z sub DR technique in hydrology, flood prediction, the detection of electric fields and ice particles, and severe storms are discussed. Dissert. Abstr.

N79-33712 Colorado Univ. at Boulder.
ON THE DYNAMICS OF THE EAST AFRICAN JET Ph.D. Thesis
Peter Richard Bannon 1979 251 p
Avail: Univ. Microfilms Order No. 7923207

The East African Jet, also popularly called the Somali jet, is viewed as a western boundary current of the East African highlands. Inertial and Coriolis forces, bottom friction, and orography are believed important in the Jet dynamics. A barotropic, primitive equation model on an equatorial beta plane is used to test this hypothesis. The flow is driven by a mass source term representing the subsidence in the southern branch of the monsoon Hadley cell. Steady, zonally symmetric solutions indicate that the combination of inertial forces, surface friction, and weak subsidence can provide an adequate description of the southeast trades over the South Indian Ocean. It is also shown that, in order for the easterly flow to change into westerlies south of the equator, convergence of the flow must occur at the transition latitude, and the meridional mass flux must vanish. A two-dimensional numerical model successfully simulates most of the major large-scale features of the climatological low-level flow over the South Indian Ocean and east coast of Africa during the northern summer. Dissert. Abstr.

N79-33713 Pennsylvania State Univ., University Park.
THE INITIALIZATION OF THE DIVERGENT COMPONENT OF THE HORIZONTAL WIND IN MESOSCALE NUMERICAL

WEATHER PREDICTION MODELS AND ITS EFFECTS ON INITIAL PRECIPITATION RATES Ph.D. Thesis
Terry Charles Tarbell 1979 244 p
Avail: Univ. Microfilms Order No. 7922356

Divergent initialization of the mesoscale numerical weather forecasting is described. A scale analysis was performed on the vertical velocity and divergence equations to determine the forms appropriate for the mesoscale (grid increments from 60 to 200 km). The scale-dependent differences of divergent initialization on the synoptic and mesoscales were studied. The mesoscale omega equation was solved by three dimensional relaxation over the domain. The observed rainfall rate was used to construct a parabolic omega profile. Five 12-hour forecasts were conducted, two with unbalanced initial conditions and three with different balanced initial conditions. Forecasts from the divergent initialization produced more precipitation than the other forecasts, especially in the first three hours. Also, the divergent initialization produced a more evenly distributed precipitation prediction. Dissert. Abstr.

N79-33714 Colorado State Univ., Fort Collins.
OBSERVATIONAL ANALYSIS OF TROPICAL CYCLONE FORMATION Ph.D. Thesis
John Leonard McBride 1979 233 p
Avail: Univ. Microfilms Order No. 7923363

The genesis of tropical cyclones through a combination of the compositing approach and the case study approach was investigated. Twelve composite data sets are analyzed from the tropical northwest Pacific and tropical northwest Atlantic Oceans. The 130 individual weather systems in the Pacific and Atlantic are examined and it is shown that the composite characteristics are always present in the individual situations. In the Atlantic, the use of shear or vorticity criterion can correctly predict the development of 13 out of 16 tropical cyclones. It provides correct predictions for 61 out of 63 nondeveloping tropical weather systems. Vertically integrated budgets of heat, momentum and kinetic energy are performed on the composite data sets and physical hypotheses are made on the mechanisms of tropical cyclone genesis and development. Dissert. Abstr.

N79-33715 Wisconsin Univ. - Madison.
THE MEASUREMENT OF RAINFALL BY LIDAR Ph.D. Thesis
Scott Thomas Shipley 1978 205 p
Avail: Univ. Microfilms Order No. 7916589

The University of Wisconsin monostatic lidar system is used to measure the spatial distribution of the optical extinction coefficient during rainfall events. A lidar calibration algorithm which estimates the magnitude of the optical extinction coefficient from uncalibrated monostatic lidar signals obtained from rainfall is presented. The results of this calibration technique are compared to simultaneous independent measurements of the total optical depth along the lidar line of sight, and it is shown that this technique determines the magnitude of the optical extinction coefficient from uncalibrated lidar signals to within (+ or -) 20% of its actual value. RHI depictions of the rainfall optical extinction coefficient are developed with a spatial resolution approximately to 15 m using lidar data obtained from the leading edge of a thunderstorm. Lidar can track subcloud precipitation features as they fall from cloud base to a rain gage located on the surface. Dissert. Abstr.

N79-33716 Ohio State Univ., Columbus.
TECHNIQUES TO ESTIMATE THE SURFACE WIND FIELD AND ASSOCIATED WAVE CHARACTERISTICS ON LAKE ERIE Ph.D. Thesis
Daniel Lewis Wise 1979 188 p
Avail: Univ. Microfilms Order No. 7922578

The development of a technique to estimate the wind field over Lake Erie is presented. To facilitate implementation and to insure maximum application, the technique employed commonly observed meteorological elements from a limited number of meteorological stations. A practical application of the estimated surface wind field was illustrated. The estimation of wave characteristics on Lake Erie was the selected application. In addition to the statistical analysis of the results, four specific applications of the estimation techniques are presented. These applications further demonstrate the ability of the techniques to ascertain spatial variations in the wind field and the usefulness of the techniques for operational applications. Suggestions for further research concerning wind field estimation, and possible applications are presented. Dissert. Abstr.

N79-33717 Oklahoma Univ., Norman.
REGIONAL WINTER CLIMACTIC VARIATIONS ASSOCIATED WITH ATMOSPHERIC CIRCULATION CHANGE IN THE COTERMINOUS UNITED STATES: 1939-1965 Ph.D. Thesis
Robert Crawford Balling 1979 235 p
Avail: Univ. Microfilms Order No. 7921225

Changes that occurred in selected climatic elements and alterations in climatic regions were examined using data from 151 first order climatological stations. The predominant circulation pattern of the atmosphere was zonal for the period 1939 through 1949 and meridional from 1955 through 1965. Circulation and moisture components changed most significantly with the shift in the circulation pattern. Generally, moisture levels decreased, and wind speeds increased as the flow pattern became meridional. Spatial patterns in composite factor scores reflected the development of an upper level ridge in the West and an upper level trough in the East during the meridional period. Regions developed across the U. S. based upon the type of climatic variation that occurred with a shift in general circulation suggest that the fluctuation in the general circulation pattern was associated with regionally homogeneous changes in the surface clamatic elements. Potential applications and implications of the findings are discussed, and suggestions for future research are presented. Dissert. Abstr.

N79-33718# National Environmental Satellite Service, Washington, D. C.
ENVIRONMENTAL SATELLITE IMAGERY: KEY TO METEOROLOGICAL RECORDS DOCUMENTATION NO. 5.4, JANUARY 1979
Jul. 1979 99 p
Avail: NTIS HC A05/MF A01 CSCL 04B

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths provided by very high resolution radiometer on the Tiros-N satellite.F.O.S.

N79-33719# National Oceanic and Atmospheric Administration, Washington, D. C.
ENVIRONMENTAL SATELLITE IMAGERY, MARCH 1979 Key to meteorological records documentation no. 5.4
Aug. 1979 99 p refs
Avail: NTIS HC A05/MF A01

Daily mosaics are presented for the Northern and Southern Hemispheres. These were prepared from data swaths provided by the very high resolution radiometer on the TIROS-N satellite. A.R.H.

N79-33720# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOME STUDIES ON MOISTURE CONDITIONS IN THE SOUTHERN HEMISPHERE
Y. Viswanadham, N. Jagan Mohana Rao, and G. S. S. Nunes Jul. 1979 32 p refs
(INPE-1507-RPE/047) Avail: NTIS HC A03/MF A01

Vertical cross sections of the seasonal mean atmospheric humidity conditions on a planetary scale for the Southern Hemisphere are presented. The fields of mean precipitable water content are analysed for the four seasons of the year. Zonally averaged values of the various quantities at several levels are presented and compared, wherever possible, with previous results. The structure of these fields in association with general circulation patterns of the atmosphere is discussed. Precipitation efficiencies for the three continents, South America, Africa and Australia are estimated. Vertical cross sections of atmospheric cooling rates for January and July are presented. Author

N79-33721# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
A CLIMATOLOGICAL AND SYNOPTIC STUDY USING RADIOSONDE DATA OF MANAUS AND BELEM (1968-1976) M.S. Thesis [UM ESTUDO CLIMATOLOGICO E SINOTICO UTILIZANDO DADOS DE RADIOSSONDAGEM

DE MANAUS E BELEM (1968-1976)]
Mary Toshie Kagano Aug. 1979 111 p refs In PORTUGUESE; ENGLISH summary Revised
(INPE-1559-TDL/013) Avail: NTIS HC A06/MF A01

At low levels, at Belem, changes of wind direction are noted, which are probably due to the effects of local wind systems. The climatological mean of precipitable water at 12 GMT is greater at Manaus than at Belem. However, the monthly means show that this is not always the case. The precipitable water at 00 GMT at Belem is greater than the 12 GMT values at both stations. The study of short-term variations revealed: (1) oscillations in the wind direction, at low levels for both stations, with a period of 3 to 5 days; (2) the relative humidity reaches a maximum immediately after the passage of the maximum cyclonic curvature (trough) in the wind field; and (3) the calculated eddy transports of humidity are $u'q' > 0$ and $v'q' < 0$. These features are in agreement with those determined in observational and theoretical studies of easterly waves. A.R.H.

N79-33722*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUMMARY OF THE NASA/MSFC FY-79 SEVERE STORM AND LOCAL WEATHER RESEARCH REVIEW
Sep. 1979 92 p Presented at the NASA/MSFC FY-79 Severe Storm and Local Weather Res. Rev., Huntsville, Ala. 12-13 Sep. 1979
(NASA-CP-2105) Avail: NTIS HC A06/MF A01 CSCL 04B

Significant acomplishments, current focus of work, plans for FY-80, and recommendations for new research are outlined for 36 research projects proposed for technical monitoring by the Atmospheric Sciences Division at Marshall Space Flight Center. Topics of the investigations, which were reviewed at a two-day meeting, relate to cloud physics, atmospheric electricity, and mesoscale/storm dynamics. A.R.H.

N79-33723# National Oceanic and Atmospheric Administration, Norman, Okla.
THE 1973-1977 ROUGH RIDER TURBULENCE-RADAR INTENSITY STUDY Final Report, Apr. 1977 - Jun. 1978
J. T. Lee and D. M. Carpenter Mar. 1979 38 p refs
(Contract DOT-FA77WAI-808)
(AD-A072693; FAA-RD-78-115) Avail: NTIS HC A03/MF A01 CSCL 04/2

An F-4-C aircraft instrumented to research turbulence, wind, and temperature during thunderstorm penetrations was used in conjunction with ground based standard weather radar and Doppler weather radar to correlate radar reflectivity with turbulent areas. Results of these flights show that as the intensity of a storm increases, the probability of encountering moderate or greater turbulence somewhere in the storm also increases. Encounters of moderate turbulence are nearly ten times more frequent when the storm's maximum reflectivity is greater than or equal to 60 dBZ than when it is 40 to 49 dBZ. There is little correlation between turbulence intensity and distance from the aircraft to center of storm at the time when the turbulence was recorded. K.L.

N79-33724# National Aviation Facilities Experimental Center, Atlantic City, N. J.
VOICE RESPONSE SYSTEM (VRS) SURVEY Final Report, Apr. - Sep. 1978
Ephraim Shochet, Hugh Milligan, and Richard J. Regan Jul. 1979 136 p refs
(AD-A072752; FAA-RD-79-47) Avail: NTIS HC A07/MF A01 CSCL 04/2

The effectiveness and acceptability of a computer-generated voice system designed to provide pilots with a limited preflight weather briefing via touchtone telephone without the intervention or assistance of a weather briefer was investigated. Questionnaries were mailed to a randomly selected group of pilots. Several followup efforts were made to obtain information from nonrespondents. Analysis of the data obtained from the questionnaires indicates: (1) user pilots have a high level of acceptance of the 'voice response system'; (2) the general aviation pilot can use the 'voice response system' effectively; and (3) the system satisfied the preflight needs of some pilots. R.E.S.

N79-33725*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS OF A STATISTICAL APPROACH TO RAINFALL ESTIMATION USING NIMBUS 5 6.7 MICROMETERS AND 11.5 MICROMETERS THIR DATA
James P. Ormsby Jul. 1979 25 p refs
(NASA-TM-80296) Avail: NTIS HC A02/MF A01 CSCL 04B

Nimbus 5 6.7 mm and 11.5 mm temperature humidity infrared radiometer (THIR) data were used in a simple multiple regression scheme to test the feasibility of using these data to estimate hourly rainfall. Throughout the test area (85 W to 105 W and 45 N to 30 N) subareas (8 deg x 6 deg) were chosen from which point to point and areal statistics were obtained. Four subsets of data were used. The first consisted of only those surface stations indicating precipitation whose latitude and longitude coincided with the THIR grid points. A second used surface stations 0.1 degree from the THIR grid points. The third was a combination of subsets one and two. A reciprocal distance weighting scheme was used to derive precipitation values in data sparse areas. A fourth subset was made using these data combined with the data from subsets one and two. Point estimates resulted in negative correlations between estimated and grid derived 'surface' precipitation. One degree areal estimates showed a slight improvement with a correlation coefficient of approximately 0.11. Single regression areal estimates resulted in correlations of approximately 0.11 and 0.20 for the 6.7 mm and 11.5 mm data respectively. These poor results were attributed to problems which are inherent in the satellite data (location errors, short temporal span of data, wavelength of sensors, etc.) and the lack of sufficient surface data to better verify the satellite estimate. Author

N79-33726# Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.
PHYSICAL CHARACTERISTICS AFFECTING THE ATMOSPHERIC BOUNDARY LAYER ABOVE URBAN AREAS
Wolfram Bahmann and Wolfgang Behnke Apr. 1977 153 p refs In GERMAN; ENGLISH summary Sponsored by Min. fuer Nissenschaft U. Forsch.
(Mitt-24) Avail: NTIS HC A08/MF A01

Using the city of Cologne, Germany, and its surrounding area as an example the effects of urban pollution and thermal inversions on weather are studied. After establishing an applicable atmosphere boundary layer model, a technical presentation of a balloon borne sounding system for measuring temperature, humidity, and wind velocity profiles as well as SO2 levels is given. Finally, a theoretical discussion of results is presented linking urban atmospheric conditions with dominant weather patterns. For individual titles, see N79-33727 through N79-33728.

N79-33727# Cologne Univ. (West Germany).
INVERSION SOUNDING IN THE COLOGNE AREA WITH A BOUNDARY-LAYER SONDE [SONDIERUNG VON INVERSIONEN IM STADTGEBIET VON KOELN MITTELS EINER GRENZSCHICHTSONDE (EIGENBAU)]
Wolfram Bahmann *In* Cologne Univ. Phys. Charac. Affecting the Atmos. Boundary Layer above Urban Areas Apr. 1977 p 1-75 refs (For primary document see N79-33726 24-47)
Avail: NTIS HC A05/MF A01

Some boundary-layer characteristics are discussed together with inversion phenomena and climatic peculiarites associated with urban areas. Practical measurements (balloon borne system) and complementing theoretical considerations are described. The equipment (sensors, electronic system, etc.) is presented together with the corresponding data processing program. High resolution temperature, humidity, and wind velocity profiles were obtained. The results are in good agreement with acoustic sounding data. Author (ESA)

N79-33728# Cologne Univ. (West Germany).
THE EFFECT OF OVERALL WEATHER CONDITIONS ON THE WIND PROFILES AND THE SO2 CONCENTRATION ABOVE THE CITY OF COLOGNE AND VICINITY [ABHAEGIGKEIT DES WINDFELDES UND DER SO2 KONZENTRATION UEBER DER STADT KOELN UND UMGEBUNG VON DER GROSSBRAEUMIGEN WETTERLAGE]

Wolfgang Behnke *In* Cologne Univ. Phys. Charac. Affecting the Atmos. Boundary Layer above Urban Areas Apr. 1977 p 76-145 refs Sponsored by Min. fuer Wissenschaft U. Forsch. (For primary document see N79-33726 24-47)
Avail: NTIS HC A08/MF A01

The meteorological conditions associated with a mountain-type wind in the Cologne area are studied. A neutral baroclinic boundary-layer model was developed to explain the orographic influence of atmospheric baroclinity on turbulent exchange and wind velocity. An interrelation between SO2 concentration, lapse rate, and geostrophic wind force is established. Author (ESA)

N79-33729# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19305BT GSRS MISSILE NO. 1067 AND 1064, ROUND NO. V-37 AND V-38, 12 JUNE 1979
Jun. 1979 20 p
(DA Proj. 1T6-65702-D-126)
(AD-A071978; ERADCOM/ASL-DR-1027) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19305BT GSRS, Missile No. 1067 and 1064, Round No. V-37 and V-38, are presented in tabular form. GRA

N79-33730# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS MISSILE NUMBER 344, ROUND NUMBER B-14
May 1979 17 p refs
(DA Proj. 1T6-65702-D-126)
(AD-A071487; ERADCOM/ASL-DR-1013) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile No. 1154, Round No. V-19, are presented in tabular form. GRA

N79-33731# National Research Council of Canada, Ottawa (Ontario). Div. of Mechanical Engineering.
DIVISION OF MECHANICAL ENGINEERING AND THE NATIONAL AERONAUTICAL ESTABLISHMENT, OTTAWA Quarterly Report, 1 Jan. - 31 Mar. 1979
31 Mar. 1979 82 p refs
(AD-A071378; DME/NAE-1979(1); ISSN-0047-9055) Avail: NTIS HC A05/MF A01 CSCL 04/1

Contents: A Comparison of the turbulent characteristics of cumulus clouds measured near Yellowknife and Thunder Bay; Indirect measurement of turbulent skin friction; current projects of the Division of Mechanical Engineering and the National Aeronautical Establisment. GRA

N79-33732# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304 GSRS MISSILE NO. 1137, ROUND NUMBER V-29, 16 MAY 1979
May 1979 20 p
(DA Proj. 1T6-65702-D-126)
(AD-A071471; ERADCOM/ASL-DR-1015) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304 GSRS, Missile Number 1137, Round Number V-29, are presented in tabular form. GRA

N79-33733# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304, GSRS MISSILE NO. 1028, 16 MAY 1979
May 1979 20 p
(DA Proj. 1T6-65702-D-126)
(AD-A071347; ERADCOM/ASL-DR-1014) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304 GSRS, Missile No. 1028, Round No. V-28, are presented in tabular form. GRA

N79-33734# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304 GSRS MISSILE NO. 1136, ROUND NUMBER V-26, 7 MAY 1979
May 1979 21 p
(DA Proj. 1T6-65702-D-126)
(AD-A071470; ERADCOM/ASL-DR-1010) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304 GSRS(FA), Missile No. 1136, Round No. V-26, are presented in tabular form. GRA

N79-33735# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 14821 LANCE, MISSILE NO. 3390, ROUND NUMBER 321 APT, 2 MAY 1979
Apr. 1979 38 p
(DA Proj. 1T6-65702-D-126)
(AD-A071468; ERADCOM/ASL-DR-1008) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 14821 Lance (AJ), Missile Number 3390, Round Number 331 APT, are presented in tabular form. GRA

N79-33736# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304 GSRS MISSILE NO. 1027, ROUND V-27, 10 MAY 1979
May 1979 21 p
(DA Proj. 1T6-65702-D-126)
(AD-A071424; ERADCOM/ASL-DR-1011) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304 GSRS, Missile Number 1027, Round Number V-27, are presented in tabular form. GRA

N79-33737# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19720 GSRS MISSILE NO. 001 AND 002, ROUND NUMBER B-12 AND B-13, 3 MAY 1979
May 1979 23 p
(DA Proj. 1T6-65702-D-126)
(AD-A071469; ERADCOM/ASL-DR-1009) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702 GSRS, Missile Numbers 001 and 002, Round Numbers B-12 and B-13, are presented in tabular form. GRA

N79-33738# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
TRANSIT TIME LIDAR MEASUREMENT OF NEAR-SURFACE WINDS IN THE ATMOSPHERE
T. L. Barber and R. Rodriguez May 1979 35 p refs
(DA Proj. 1L1-61102-B-53A)
(AD-A071355; ERADCOM/ASL-TR-0033) Avail: NTIS HC A03/MF A01 CSCL 04/2

This report deals with an improved model of a transit time laser radar. The technique measures a backscatter signal from atmospheric aerosols from two sample volumes a known distance apart in the atmosphere. These two signals are cross-correlated to obtain the time of flight of aerosol inhomogeneities as they move from one volume to another. Once the time of flight is calculated, the windspeed can be obtained since the distance between sample volumes is known. This model utilizes a copper vapor laser as the transmitter source. Crosswind data were successfully obtained in the unperturbed atmosphere under very clear, and thus difficult, conditions with horizontal visibility of 130 km. Results of the experiments showed that even under these conditions the variability of the aerosol concentration was high enough to permit a correlation that generated a reliable wind measurement at least once a minute. Transit time lidar wind measurements agreed within 15 percent of values simultaneously recorded with an anemometer. GRA

N79-33739# RAMCOR, Inc., Vienna, Va.
A REPORT ON ATMOSPHERIC OBSTRUCTIONS TO VISIBILITY. VOLUME 2: RESULTS OF LITERATURE SEARCH Final Report
Victor J. Lujetic 10 Mar. 1979 80 p refs
(Contract DAAK70-78-C-0109)
(AD-A071742; ETL-0170-Vol-2; RC168-001-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 04/2

The aims and objectives of this report were to collect and

assimilate information and synthesize data on the effects of atmospheric obstructions to visibility. A large part of the total study effort involved an extensive literature search and compilation of a reference and abstract bibliography related to atmospheric effects on visibility. This Volume II includes both the extensive bibliography and abstracts of selected publications related to atmospheric obstructions to visibility and related topics. The information contained in this volume was oriented to the non-specialist. GRA

N79-33740# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702 GSRS, MISSILE NO. 386, ROUND NO. B-5
Mar. 1979 20 p
(DA Proj. 1T6-65702-D-127)
(AD-A070560; ECOM-DR-993) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702 GSRS, Missile Number 386, Round Number B-5, are presented in tabular form. GRA

N79-33741# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NO. 361, ROUND NO. B-4
Mar. 1979 19 p
(DA Proj. 1T6-65702-D-127)
(AD-A070563; ECOM-DR-991) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702A GSRS, Missile Number 361, Round Number B-4, are presented in tabular form. GRA

N79-33742# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NO. 339, ROUND NO. B-8
Apr. 1979 19 p
(DA Proj. 1T6-65702-D-126)
(AD-A070562; ECOM-DR-998) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702A GSRS, Missile Number 339, Round B-8, are presented in tabular form. GRA

N79-33743# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
MICROPHYSICAL AND OPTICAL PROPERTIES OF CALIFORNIA COASTAL FOGS AT FORT ORD
Richard D. H. Low, Louis D. Duncan, Y. Y. Roger, and R. Hsiao
Jun. 1979 38 p refs
(DA Proj. 1L1-62111-AH-71; DA Proj. 1T1-61101-A-91A)
(AD-A071787; ERADCOM/ASL-TR-0034) Avail: NTIS HC A03/MF A01 CSCL 04/2
During the period of 12 April through 12 May 1978, the Atmospheric Sciences Laboratory obtained meteorological, optical, and microphysical data in support of the Copperhead optical system performance test under inclement weather conditions. On 3 and 9 May, two well-developed heavy fogs occurred which would seriously degrade the performance of the Copperhead optical system. The first fog was of the advection type and the latter the radiation type but aided by gentle advection. While their synoptic geneses were only briefly touched upon, their microphysical features were examined in greater detail. The radiation fog on 9 May contained twice as much liquid water as the advection fog on 3 May although they both had a haze regime. Comparisons were made with other California coastal fogs to draw a general picture of their microstructures. On the basis of limited data, these fogs appeared to share certain common features such as mean and mode radii and liquid water content. For their optical properties in the visible region, the data points of these two fogs were plotted against Low's generalized or equivalent regression line. About 83 percent of them fall within 15 percent deviation, and all lie within 50 percent deviation. Moreover, the line holds better for the 3 May case than for the 9 May case. Pending further verification, the present study seems to indicate that Low's scaling law may be incorporated as an interim model. GRA

N79-33744# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19305A GSRS MISSILE NO. 1044, ROUND NO. V-34
May 1979 15 p
(DA Proj. 1T1-66572-D-126)
(AD-A071881; ERADCOM/ASL-DR-1024) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19305A GSRS, Missile No. 1044, Round No. V-34, are presented in tabular form. GRA

N79-33745# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304A GSRS MISSILE NO. 1138, ROUND NO. V-30
21 May 1979 20 p
(DA Proj. 1T6-65702-D-126)
(AD-A071919; ERADCOM/ASL-DR-1017) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19304A GSRS, Missile No. 1138, Round No. V-30, are presented in tabuiar form. GRA

N79-33746# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19305A GSRS MISSILE NO. 1032, ROUND NO. V-32
May 1979 20 p
(AD-A071779; ERADCOM/ASL-DR-1020) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19305A GSRS, Missile No. 1032, Round No. V-32, are presented in tabular form. GRA

N79-33747# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702D GSRS MISSILE NO. 363, ROUND NO. B-15
16 May 1979 17 p
(DA Proj. 1T6-65702-D-126)
(AD-A071918; ERADCOM/ASL-DR-1016) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702D GSRS, Missile No. 363, Round No. B-15, are presented in tabular form. GRA

N79-33748# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS MISSILE NO. 388, ROUND NO. B-17
30 May 1979 18 p
(AD-A071976; ERADCOM/ASL-DR-1023) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702A GSRS, Missile No. 388, Round No. B-17, are presented in tabular form. GRA

N79-33749# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19305A GSRS MISSILE NO. 1033, ROUND NO. V-36
May 1979 18 p
(DA Proj. 1T6-66570-2D-126)
(AD-A071977; ERADCOM/ASL-DR-1026) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19305A GSRS, Missile No. 1033, Round No. V-36, are presented in tabular form. GRA

N79-33750# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS MISSILE NO. 080 ROUND NO. B-16
30 May 1979 18 p
(AD-A071993; ERADCOM/ASL-DR-1022) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702A GSRS, Missile No. 080, Round No. B-16, are presented in tabular form. GRA

N79-33751# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19305A GSRS MISSILE NO. 1053, ROUND NO. V-35
31 May 1979 17 p

(AD-A071994; ERADCOM/ASL-DR-1025) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 1930A GSRS, Missile No. 1053, Round No. V-35, are presented in tabular form. GRA

N79-33752# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 19702A GSRS MISSILE NO. 021, ROUND NO. B-18, 14 JUNE 1979

Jun. 1979 18 p

(DA Proj. 1T6-657UZ-U-126)

(AD-A071979; ERADCOM/ASL-DR-1028) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile No. 021, Round No. B-18, are presented in tabular form. GRA

N79-33753# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 14818 C LANCE MISSILE NO. 4355 ROUND NO. 329 APT

Apr. 1979 34 p

(AD-A070642; ERADCOM/ASL-DR-1006) Avail: NTIS HC A03/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 14818C Lance, Missile Number 4355, Round Number. 329 APT, are presented in tabular form. GRA

N79-33754# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 19702A GSRS, MISSILE NO. 086, ROUND NUMBER B-9

Apr. 1979 19 p

(DA Proj. 1T6-65702-E-126)

(AD-A070566; ECOM-DR-1001) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19702A GSRS, Missile Number 086, Round No. B-9, are presented in tabular form. GRA

N79-33755# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 19304D GSRS, MISSILE NO. 1021, ROUND NO. V-24

Apr. 1979 16 p

(DA Proj. 1T6-65702-D-126)

(AD-A070565; ECOM-DR-1005) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304D GSRS, Missile Number 1021, Round Number V-24, are presented in tabular form. GRA

N79-33756# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.

THE 19304B GSRS, MISSILE NO. 1022, ROUND NUMBER V-22

Apr. 1979 18 p

(DA Proj. 1T6-65702-D-126)

(AD-A070564; ECOM-DR-1000) Avail: NTIS HC A02/MF A01 CSCL 04/2

Meteorological data gathered for the launching of 19304B GSRS, Missile Number 1022, Round V-22, are presented in tabular form. GRA

N79-33757# Ruhr Univ., Bochum (West Germany). Geographisches Inst.

CLIMATIC FLUCTUATIONS IN MARITIME AND CONTINENTAL EUROPE SINCE 1871 [KLIMASCHWANKUNGEN IN MARITIMEN UND KONTINENTALEN RAUM EUROPAS SEIT 1871]

Anne-Marie MeyerzuDuettingdorf Jun. 1978 139 p refs In GERMAN; ENGLISH summary

(ISBN-3-506-71212-8) Avail: NTIS HC A07/MF A01

Climatic data obtained from seven stations in western and southeastern Europe are presented in diagram form. Trends are investigated. It is revealed that an increase in meridional circulation took place during the second half of the nineteenth century and also, that in 1897 the air pressure gradient between northern and southern Europe increased. A minimum annual temperature range is observed during the 1910 to 1959 period. From 1939 to 1949, a cycle with increasingly, continental summer/winter temperature range occurred. It is concluded that the fluctuations observed are manifestations of recurrent weather patterns and synoptic situations in both areas. Author (ESA)

N79-33758# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.

CASE STUDIES ON CONVECTIVE STORMS. CASE STUDY 2, 22 JUNE 1976: FIRST ECHO CASE

Daniel W. Breed Dec. 1978 60 p refs

(Grant NSF ATM-77-23757)

(PB-295753/8; NCAR/TN-132-STR) Avail: NTIS HC A04/MF A01 CSCL 04B

A sailplane and a 306D Queen Air made a coordinated study of a well developed storm from about 1420 to 1505. The sailplane, penetrating the storm at 5.5 - 9.0 km MSL, encountered two discrete cells with updraft maxima of 15 and 24 m/sec and liquid water contents exceeding 3(g/m cubed). The maximum precipitation concentration data suggest that the precipitation process was well developed during the sailplane penetration of the two cells, which took place 15-35 minutes past the initial formation of the -5 dBZ reflectivity level. The Queen Air sampled conditions below cloud base which was measured at 3860 m. Precipitation was present, and little evidence of strong updrafts or storm inflow was detected in the area investigated by 306D. GRA

N79-33759# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.

CASE STUDIES ON CONVECTIVE STORMS. CASE STUDY 1, 22 JUNE 1976: FIRST ECHO CASE

Daniel W. Breed Dec. 1978 70 p refs

(Grant NSF ATM-77-23757)

(PB-295754/8; NCAR/TN-130-STR) Avail: NTIS HC A04/MF A01 CSCL 04B

The sailplane penetrated a growing turret on the west side of a developing echo system prior to the time of the radar 'first echo' at the sailplane's altitude. During the 7 minute in-cloud period, the sailplane encountered strong updrafts (maximum 22 m/sec) and increasing ice particle concentrations with time. Radar support was insufficient in providing a total reflectivity history about the sailplane's cloud penetration. The maximum reflectivity encountered by the sailplane was 15-20 dBZ(e). Particle camera data indicated that precipitation-sized particles were exclusively ice; no liquid drops greater than cloud droplet size were detected. GRA

N79-33760# National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.

NATIONAL HURRICANE AND EXPERIMENTAL METEOROLOGY LABORATORY COLLECTED REPRINTS, 1978

May 1979 276 p refs

(PB-297094/5; NOAA-79061104) Avail: NTIS HC A12/MF A01 CSCL 04B

Reports of research that appeared in 1978 as journal articles or in conference proceedings are presented. Abstracts are included from papers published in the NOAA Technical Report and Technical Memorandum series. Reprints in this collection are arranged alphabetically by author within organizational unit. Subjects encompassed are: analytical and theoretical studies, cumulus clouds, and other studies of hurricanes. GRA

N79-33761# National Hurricane Center, Coral Gables, Fla.

A GUIDE TO ATLANTIC AND EASTERN PACIFIC MODELS FOR THE PREDICTION OF TROPICAL CYCLONE MOTION

Charles J. Meumann Apr. 1979 33 p refs

(PB-297141/4; NOAA-TM-NWS-NHC-11; NOAA-79051103) Avail: NTIS HC A03/MF A01 CSCL 04B

A number of prediction models, both statistical and dynamical, are used as objective guidance preparatory to the issuance of tropical cyclone advisories for the Atlantic and the Eastern Pacific areas. A brief description of these models is presented and each is placed in its proper historical and operational perspective. A homogeneous sample of operational forecasts is used to compare the performance of the CLIPER (Climatology and Persistence)

model, the latter being considered a king of base-line skill model. GRA

N79-33762# National Hurricane Center, Coral Gables, Fla.
STATISTICAL FORECASTS OF TROPICAL CYCLONE INTENSITY FOR THE NORTH ATLANTIC BASIN
Brian R. Jarvinen and Charles J. Neumann Apr. 1979 28 p refs
(PB-297185; NOAA-TM-NWS-NHC-10; NOAA-79051102) Avail: NTIS HC A03/MF A01 CSCL 04B

The derivation of a system of statistical regression equations for the prediction of tropical cyclone intensity changes over the Atlantic tropical cyclone basin is described. The study is part of a larger effort to increase operational skill in the prediction of tropical cyclone intensity. The present study is limited to predictors derived from climatology and persistence. However, extensions of the study will include the use of predictors derived from environmental data fields. Independent data tests of the system over the 1976 and 1977 Atlantic hurricane season disclose a skill comparable to the official forecast of intensity changes. However, based on mean absolute errors, the model improves slightly on the official forecast for the 12 and 24h forecast periods while the reverse is true for the 48 and 72h forecast periods. GRA

N79-33763# Nevada Univ. System, Reno. Atmospheric Sciences Center.
CLIMATIC TRENDS IN THE ARID SOUTHWEST Final Report
Nov. 1979 61 p refs
(PB-296051/6; NSF/RA-780570) Avail: NTIS HC A04/MF A01 CSCL 04B

The general research needs related to the assessment of climate trends in the arid Southwest identified in this report are: the influence of air pollution; general circulation - synoptic climatology; and desertification trends. Research concerning the manner in which the different scales of atmospheric motion-global, synoptic, and mesoscale - relate to changes in weather and climate in the Southwest is identified. An experiment is suggested to learn if the destruction of vegetation over large areas enhances desertification. GRA

N79-33764# National Oceanic and Atmospheric Administration, Washington, D. C. Federal Coordinator for Meteorological Services and Supporting Research.
NATIONAL HURRICANE OPERATIONS PLAN
May 1979 67 p Revised
(PB-297084/6; NOAA-S/T-79-201; FCM-79/2; NOAA-79060404) Avail: NTIS HC A04/MF A01 CSCL 04B

The Hurricane Warning Service is an interdepartmental effort to provide the Nation and designated international recipients with environmental data, forecasts, and assessments concerning tropical and subtropical weather systems. Interdepartmental cooperation achieves economy and efficiency in the operation of the Hurricane Warning Service. This plan provides the basis for implementing the agreements of the Department of Commerce, Department of Defense, and the Department of Transportation reached at the annual interdepartmental Hurricane Warning Conference (combined Atlantic and Pacific). GRA

N79-33765# National Ocean Survey, Rockville, Md.
SUMMARY AND ANALYSIS OF SYNOPTIC METEOROLOGICAL OBSERVATIONS IN SELECTED COASTAL MARINE AREAS
Feb. 1979 94 p Sponsored by the Dept. of Commerce
(PB-296915/2; NOAA-79051009) Avail: NTIS HC A05/MF A01 CSCL 04B

The meteorological parameters presented are : (1) percentage frequency of sea height in feet; (2) monthly mean wave height rounded off to the nearest foot and percentage frequency of wave height in feet; (3) percentage frequency of wind speed in knots; (4) percentage frequency of visibility in nautical miles; and (5) percentage frequency of air temperature in degrees Fahrenheit. The selected coastal marine areas are grouped into seven geographical areas: Great Lakes, East Coast, Gulf Coast, Atlantic Islands, Pacific Islands, West Coast and Alaskan Coast. GRA

N79-33766# National Hurricane and Experimental Meteorology Lab., Coral Gables, Fla.
FLORIDA AREA CUMULUS EXPERIMENT (FACE): OPERATIONAL SUMMARY AND DATA INVENTORY, 1978
May 1979 276 p refs
(PB-297093/7; NOAA-TM-ERL-NHEML-4; NOAA-79061103) Avail: NTIS HC A13/MF A01 CSCL 04B

The confirmatory phase of the Florida Area Cumulus Experiment (FACE-2) began in 1978. The focus of FACE-2 is confirmation of the results of FACE-1, which indicate that dynamic seeding increased precipitation over a fixed target area. The double-blind nature of the experiment was strengthened and fixed periods of experimentation treatment and observation were specified. FACE 1978 had ambitious cloud physics and CAPPI (Constant Altitude Plan Position Indicator) radar programs to investigate the response of the clouds to treatment. Other aspects of FACE 1978 were FACE Control, the surface networks, atmospheric sounding, photography, lightning, and satellite subprograms, and the documentation of daily weather conditions. GRA

N79-33767# National Center for Atmospheric Research, Boulder, Colo. Convective Storms Div.
FIELD SEASON WORKSHOP REPORT, 1980
G. Vali Mar. 1979 57 p Workshop held at Winter Park, Colo., 28-30 Nov. 1978
(Grant NSF ATM-77-23757)
(PB-295623/3; NCAR/TN-133-PROC) Avail: NTIS HC A04/MF A01 CSCL 04B

The planning of a field program to gather sufficient data on both the microphysics and dynamics of convective clouds and storms to reveal how their interactions lead to the formation of precipitation, especially hail is presented. GRA

N79-33768# National Center for Atmospheric Research, Boulder, Colo.
CASE STUDIES ON CONVECTIVE STORMS. CASE STUDY 3, 8 JUNE 1976: FIRST ECHO CASE
Daniel W. Breed Mar. 1979 101 p refs
(Grant NSF ATM-77-23757)
(PB-295651/4; NCAR/TN-134-STR) Avail: NTIS HC A06/MF A01 CSCL 04B

Extensive coverage by three aircraft in the inflow region of a maturing storm is presented. The synoptic conditions supported convection of moderate strength, with the activity initially forming and organizing northeast of Cheyenne. The resulting storm moved east, then southeast, maintaining a high reflectivity core on the southeast side in the direction of low-level inflow. The data from the aircraft investigations are presented in relation to the radar data. The data show the interactions of individual cells with each other and with the storm mass to be varied and complex. GRA

N79-33769# National Center for Atmospheric Research, Boulder, Colo.
TROPICAL TELECONNECTIONS TO THE SEESAW IN WINTER TEMPERATURES BETWEEN GREENLAND AND NORTHERN EUROPE M.S. Thesis - Colo. Univ. Final Report
Gerald Allen Meehl (Colo. Univ., Boulder) 1978 124 p refs
(Grant NSF ATM-77-23757)
(PB-295652/2; NCAR/CT-51; INSTAAR-OP-28; ISSN-0004-6145) Avail: NTIS HC A06/MF A01 CSCL 04B

Tropical teleconnections to the seasaw in winter temperatures between Greenland and N. Europe (low temperatures over N. Europe when high over Greenland and vice versa are discussed. The strength of mean sea level westerlies in the central N. Atlantic during seesaw winters is highly correlated with NE and SE trades in the Atlantic. A significant correlation exists between the strength of the NE and SE trades in the Atlantic in seesaw winters but not in other winters. Atmospheric patterns appear strongly only during seesaw winters, although small magnitude pressure anomaly patterns are present in autumns preceding seesaw winters. GRA

N79-33770# National Center for Atmospheric Research, Boulder, Colo.
THE INFLUENCE OF THERMAL FRONTS UPON THE

SOLUTIONS OF AN ANALYTICAL MODEL OF A MID-LATITUDE WAVE-CYCLONE Ph.D. Thesis - Fla. State Univ.
Richard Grotjahn (Fla. State Univ.) 1979 175 p refs
(Grant NSF ATM-77-23757)
(PB-295677/9; NCAR/CT-52) Avail: NTIS HC A08/MF A01 CSCL 04B

Perturbation methods are used to formulate and solve this model. The model is continuous in three space dimensions and time. A transformation to geostrophic coordinates is employed that includes some ageostrophic effects, and additional ageostrophic terms are retained after scaling the primitive equations. The model is adiabatic, frictionless, and fully compressible, and the Coriolis parameter varies linearly. Perturbation series solutions are obtained which incorporate effects from vertical and horizontal shear upon quasi-geostrophic and ageostrophic terms. Normal mode solutions are found which grow due to barotropic and (primarily) baroclinic instability of the zonal flow. GRA

N79-33771# Bureau of Reclamation, Denver, Colo.
HIGH PLAINS COOPERATIVE PROGRAM, DATA INVENTORY 1978
Dec. 1978 98 p refs
(PB-295879/1) Avail: NTIS HC A05/MF A01 CSCL 04B

An inventory is presented of all data that were collected in association with the HIPLEX (High Plains Cooperative Program), a weather modification research project in spring and summer convective cloud seeding, from May through July 1978. It is subdivided into 11 sections: (1) site maps; (2) radar; (3) satellite; (4) aircraft; (5) rawinsondes; (6) precipitation gages; (7) mesoscale sites; (8) nuclei; (9) photographic; (10) NWS, FAA, and National Climatic Center products; and (11) miscellaneous observations, notes, and reports. GRA

N79-33772# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
PROJECT SKYWATER FISCAL YEARS 1977-1978 REPORT. ATMOSPHERIC RESOURCES MANAGEMENT PROGRAM Progress Report, 1975 - 1978
May 1979 172 p Sponsored by the Dept. of Interior
(PB-296243/9) Avail: NTIS HC A08/MF A01 CSCL 04B

Research conducted under the precipitation management program in fiscal years 1975-78 is summarized. One completed project, two projects in progress, and one project in preliminary planning are described. These include Colorado River Basin Pilot Project; High Plains Cooperative Program; Sierra Cooperative Pilot Project; Colorado River Basin Program. A synopsis is given of contracts devoted to orographic research in general. Equipment developed in support of general atmospheric research is discussed as well as pertinent contracts following the main summaries, and Project Skywater inhouse support and research activities. GRA

N79-33773# North American Weather Consultants, Goleta, Calif.
A RADAR CLIMATOLOGY OF WINTER STORMS IN NORTHERN CALIFORNIA FOR THE SIERRA COOPERATIVE PILOT PROJECT Final Report
Joe L. Sutherland and John W. Kidd Dec. 1978 327 p
(Contract DI-6-07-DR-20130)
(PB-295862/7; NAWC-78/32) Avail: NTIS HC A15/MF A01 CSCL 04B

A radar climatology of northern Sierra Nevada winter storms is presented. Analysis of digitized radar data was directed towards: (1) convective band locations and motions; (2) convective cell locations and motions; (3) cloud top structures; and (4) the development of Z-R relationships. Six basic echo types were identified. Each echo identified in the analysis was categorized into one of these six types (consisting of bands, stationary bands, cells, multi-cells, orographic, and area). In general, it was demonstrated that bands occurred more frequently in prefrontal and frontal conditions while cellular echoes were more common post-frontal. Convection was a common feature of nearly every storm during at least some segment of the storm. GRA

N79-33774# National Hurricane Center, Coral Gables, Fla.
INFLUENCE OF EARTH SURFACE AND CLOUD PROPERTIES ON THE SOUTH FLORIDA SEA BREEZE
Patrick T. Gannon, Sr. Sep. 1978 97 p refs
(PB-297398; NOAA-TR-ERL-402; NHEML-2;
NOAA-79061307) Avail: NTIS HC A05/MF A01 CSCL 04A

A two dimensional numerical sea breeze model that includes radiation and heat budget physics was used to study sea breeze circulations affected by South Florida surface and cloud conditions. Sensitivity experiments show major differences in the intensities and inland penetrations that result from prescribed distributions of surface and cirrus cloud properties. Soil moisture is the dominant controlling surface property, followed by albedo and thermal inertia. Cirrus clouds can prevent the evolution of the sea breeze when the geometric thickness of cirrus exceeds 2 km. The mesoscale sea breeze convergence zone is seen to evolve adjacent to organized cloud fields, but not necessarily coincident with them. GRA

N79-33775# Texas Dept. of Water Resources, Austin. Weather Modification and Technology Section.
A REVIEW OF TEXAS WEATHER IN 1978: A YEAR OF RARE EXTREMES
George W. Bomar Jan. 1979 431 p
(PB-296465/8; LP-88) Avail: NTIS HC A19/MF A01 CSCL 04B

Noteworthy elements of Texas weather during 1978 are described. The causes and effects of the significant weather systems affecting Texans during the year are examined. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N79-33776 Texas A&M Univ., College Station.
ANTICYCLONIC RINGS AND THE ENERGETICS OF THE CIRCULATION OF THE GULF OF MEXICO Ph.D. Thesis
Brady Allen Elliott 1979 203 p
Avail: Univ. Microfilms Order No. 7919067

The primary energy source for the anticyclonic gyre found in the western Gulf of Mexico is discussed. Two energy sources are considered: the loop current through the mechanism of the anticyclonic rings that separate from that current; and the curl of the wind stress. To resolve which of these two mechanisms dominate, the energy input into the western Gulf by each is estimated; they are then compared to each other, and to the energetics of the circulation of the western Gulf. The rings and the wind stress mechanisms are first considered descriptively, with the primary emphasis on the time and space scales of the rings and the seasonal variations in the curl. Dissert. Abstr.

N79-33777 North Carolina State Univ. at Raleigh.
THE EFFECT OF A LOCALIZED TOPOGRAPHIC IRREGULARITY ON THE FLOW OF A BOUNDARY CURRENT ALONG THE CONTINENTAL MARGIN Ph.D. Thesis
Shenn-Yu Chao Feb. 1978 72 p
Avail: Univ. Microfilms Order No. 7923041

A model for the effect of a localized topographic irregularity on a barotropic sheared current flowing along a continental margin with shallow water to the left of the current is discussed. The amplitude of the disturbance depends on the volume of the irregularity and its location on the margin. For a certain class of velocity and topographic profiles a closed form solution is obtained. The current is deflected seaward downstream of the disturbance with the maximum deflection occurring 1/4 of a wavelength downstream of the irregularity. Closed eddies are formed in shallow water and sometimes in deep water. If the ratio of relative shear to the speed of the approaching current is large at the continental margin, a simple analytical solution is applicable. The model is applied to the Gulf Stream flowing of the Carolina coast. Dissert. Abstr.

N79-33778 Colorado Univ. at Boulder.
THE TIDAL MOTIONS OF A ROTATING, ELLIPTICAL, ELASTIC AND OCEANLESS EARTH Ph.D. Thesis
John Matthew Wahr 1979 227 p
Avail: Univ. Microfilms Order No. 792329

A theoretical study is presented of the response of a rotating, elliptical and elastic Earth to the combined gravitational attraction

of the Sun and Moon. Five of the most heavily constrained contemporary models of the Earth's material structure are considered (all have a fluid outer core and a solid inner core). The non-orbital part of the response is separated into the body tide (the Earth's deformation), the precession and nutation of the Earth, and changes in the Earth's rotation rate. In particular, the nutations are shown to be the best represented by motion of the Tisserand mean figure axis of the surface, which also is essentially a mean mantle fixed axis. An eigenfunction expansion technique is developed and used to compute the total induced displacement. Dissert. Abstr.

N79-33779*# Mississippi State Univ., State College. Dept. of Geology and Geography.
BEACH EROSION CONTROL STUDY AT PASS CHRISTIAN
31 Dec. 1978 173 p refs
(Grant NGL-25-001-054)
(NASA-CR-162349) Avail: NTIS HC A08/MF A01 CSCL 08C

The methods of measuring the existence of erosion and the effects of sand stabilization control systems are described. The mechanics of sand movement, the nature of sand erosion, and the use of satellite data to measure these factors and their surrogates are discussed using the locational and control aspects of aeolian and litoral erosion zones along the sand beach of the Mississippi coast. The aeolian erosion is highlighted due to the redeposition of the sand which causes high cleanup costs, property damage, and safety and health hazards. The areas of differential erosion and the patterns of beach sand movement are illustrated and the use of remote sensing methods to identify the areas of erosion are evaluated. A.W.H.

N79-33780# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
LAMINAR AND TURBULENT BOUNDARY LAYERS ADJACENT TO MELTING VERTICAL ICE WALLS IN SALT WATER
Edward George Josberger May 1979 217 p refs
(Contract N00014-76-C-0234)
(AD-A071809; SCIENTIFIC-16) Avail: NTIS HC A10/MF A01 CSCL 08/12

A laboratory study of melting vertical ice sheets immersed in sodium chloride solutions of oceanic temperatures and salinities found that the convective motions generated by the melting consist of two regions confined to a boundary layer adjacent to the ice. The first region, at the bottom of the ice, is laminar and bidirectional, with a 2 to 3 mm thick upward flowing layer next to the ice inside of a 10 mm thick outer downward flowing layer. This bidirectionality results from the large difference between the thermal and saline diffusivities which contain dilute water near the ice and allows the cooling to diffuse further from the ice. Near the ice, dilute cold water rises; while away from the ice, cold saline water sinks. Second, further up the ice, the inner layer goes through a region of transition and becomes fully turbulent when the saline Grashof number reaches 2 x 10 to the 8th power. The turubulent flow is upward, unidirectional and the dominant flow in the oceans. Author (GRA)

N79-33781# Naval Postgraduate School, Monterey, Calif.
FINESTRUCTURE, FRONTS AND CURRENTS IN THE PACIFIC MARGINAL SEA-ICE ZONE: MIZPAC 78 M.S. Thesis. Interim Report, 14 Jul. 1978 - 12 Apr. 1979
Warren Edgar Small Jun. 1979 86 p refs
(ZF52555001)
(AD-A071970; NPS68-79-002) Avail: NTIS HC A05/MF A01 CSCL 08/10

Sharp vertical temperature fronts, complex temperature inversions and current patterns in the Chukchi Sea during MIZPAC 78 in July 1978 were investigated in a further effort to define the mechanisms for the formation and distribution of finestructure. In conformity with previous findings, upper and lower-layer fronts near the ice tended to be coincident in the V-shaped zones between bifurcating current streams; such fronts were not associated with significant finestructure. Previous thought would indicate that finestructure is found near wedge-like fronts. However, the situations for which this could be tested in 1978 were too few to be conclusive. Two of the principal ice embayments, which were apparently caused by warm water streams, were found in approximately the same locations as in previous years. Upper-level current streams, deduced from the ice melt-back into embayments and from warm-water cores, appear to be bathymetrically steered. Both of the above mentioned bays contain temperature finestructure. GRA

N79-33782# Naval Research Lab., Washington, D. C.
COMPUTER PROGRAM THAT PROCESSES ENVIRONMENTAL DATA TO FACILITATE CONTOURING Interim Report
Marilyn L. Blodgett 21 Jun. 1979 27 p
(ZF52552003)
(AD-A071615; NRL-8305) Avail: NTIS HC A03/MF A01 CSCL 08/10

A program has been written to read GEODATA formatted tapes containing bathymetric and/or magnetics data. The program identifies the high and low values and finds or interpolates values of a certain interval (every 500 meters, every 50 gammas). The program was written to aid the scientist in producing contour charts. The program was written in FORTRAN IV for use on the CDC 3800; however, it can be changed rather easily to run on other systems. GRA

N79-33783# Scripps Institution of Oceanography, La Jolla, Calif.
RAPID SAMPLING OF TEMPERATURE AND TEMPERATURE GRADIENT USING XBT'S
B. P. Johnson and R. Edward Lange 15 Mar. 1979 39 p
(Contract N00014-75-C-0152)
(AD-A068309; SIO-REF-79-4) Avail: NTIS HC A03/MF A01 CSCL 08/10

During the summer of 1977, as part of the near-surface component of the POLYMODE Local Dynamics Experiment, a set of observations of temperature variability was undertaken. One subset of these observations was undertaken by the authors. GRA

N79-33784# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
COASTAL UPWELLING ECOSYSTEM ANALYSIS. DATA REPORT 54: ETS AND NITRATE REDUCTASE ACTIVITIES IN THE PERU CURRENT, MARCH, APRIL, AND MAY 1977. JOINT 2 R/V WECOMA. (LEGS 1, 2, AND 3)
F. W. Setchell Sep. 1978 133 p refs Sponsored by NSF, Washington, D. C.
(PB-295799/1; Contrib-78032; NSF/IDOE-79-35) Avail: NTIS HC A07/MF A01 CSCL 08A

The JOINT II MAM-77 expedition was an extensive and intensive study of the upwelling system off the coast of southern Peru. The project comprised 4 ships (R/V WECOMA, R/V COLUMBUS ISLEN, R/V CAYUSE, and R/V MELVILLE), an aircraft which mapped sea surface temperature and winds aloft, several shore based meteorological stations, moored current meter arrays and meteorological buoys. Of the ships, the R/V WECOMA was dedicated during the entire project to biology, principally to phytopiankton. The sampling scheme of the R/V WECOMA was designed to provide data from Eulerian time series at location C-3, La Grangian time series along droque tracks, as well as cross shelf biology. GRA

N79-33785# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
DEEP OCEAN MINING ENVIRONMENTAL STUDY (DOMES). UNPUBLISHED MANUSCRIPT NO. 31: BEHAVIORAL RESPONSE OF YELLOWFIN TUNA, 'THUNNUS ALBACARES' AND KAWAKAWA, EUTHINNUS AFFINIS TO TURBIDITY
Michael Barry Aug. 1978 76 p refs
(PB-297106/7; NOAA-ERL-DOMES-31; NOAA-79051702) Avail: NTIS HC A05/MF A01 CSCL 08A

As a part of the Deep Ocean Mining Environmental Study (DOMES), studies were designed to investigate the effects of the surface discharge of bottom sediments on tuna behavior. It is clear that tunas can detect and avoid areas of high turbidity in captivity. Although avoidance reactions to high turbidity levels were often quite abrupt, the clouds did not seem excessively aversive or toxic. The tunas usually did not show stereotyped behavior or become ill as a result of short term exposure to turbidities in the range tested. Vision is probably the most

important sense employed by the tunas to detect the cloud, but the behavioral responses to low turbidities could be related to the smell of the cloud. GRA

N79-33786# California Univ., Berkeley. Water Resources Center.
SALINITY INTRUSION AND GRAVITATIONAL CIRCULATION IN PARTIALLY STRATIFIED ESTUARIES Ph.D. Thesis
John Martin Hamrick May 1979 479 p refs
(Grant NSF GI-34932; UCAL Proj. WRC-W-486)
(PB-296643/0; W79-07131) Avail: NTIS HC A21/MF A01 CSCL 08C

Mathematical and physical modeling is used to study the dynamics of salinity intrusion in partially stratified estuaries when the residual gravitational circulation is the primary mechanism for longitudinal dispersion and salt transport. The effects of transverse variations in channel depth on the three dimensional circulation patterns and the salinity distribution are qualified. Solutions are obtained using perturbation and finite element methods for the three dimensional residual gravitational circulation velocity and salinity distributions in estuaries of constant nonrectangular prismatic cross section. The resulting longitudinal dispersion coefficients representing salt transport by the residual gravitational circulation are used to develop a one dimensional salt transport equation. GRA

N79-33787# Woods Hole Oceanographic Institution, Mass.
SEASONAL OSCILLATIONS IN A MID-LATITUDE OCEAN WITH BARRIERS TO DEEP FLOW Ph.D. Thesis
Eric Firing Mar. 1979 270 p refs
(Grants NSF OCE-74-19782; NSF OCE-77-15600)
(PB-295971/6; WHOI-79-35) Avail: NTIS HC A12/MF A01 CSCL 08C

A two layer linear analytic model was used to study the response of the mid-latitude ocean to the seasonal variation of the windstress. The most important component of the response was a barotropic quasi-steady Sverdrup balance. A meridional ridge such as the Antilles Arc was modeled as an infinitely thin meridional barrier that blocked the lower layer but did not protrude into the upper layer. It was found that such a barrier had little effect on the upper layer flow across the barrier. A study of the dynamics of flow over a sloping bottom was made and the results were used to determine the effect on seasonal oscillations of eastern boundary slopes and triangular ridges. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N79-33788# Army Research Inst. of Environmental Medicine, Natick, Mass.
COMPOSITION OF CEREBRAL FLUIDS IN GOATS ADAPTED TO HIGH ALTITUDE
V. Fencl, R. A. Gabel, and C. Wolfe 23 Jan. 1979 32 p refs
(DA Proj. 3A1-61101-A-910)
(AD-A070142; USARIEM-M-6/79) Avail: NTIS HC A03/MF A01 CSCL 06/16

The ionic composition of cerebral ISF was explored in 6 unanesthetized goats at sea level (SL) and again after 5 days at simulated high altitude (HA) of 4300 m, by measuring net transependymal fluxes of HCO3 ion, Cl ion and lactate during ventriculo-cisternal perfusions with lactate-free artificial CSF with various (HCO3 ion) and (Cl ion): concentration of an ion in cerebral ISF is indicated by concentration of that ion in the inflowing perfusate, that produces zero flux. We conclude that, at SL, (HCO3 ion) and (Cl ion) in CSF were the same as in cerebral ISF, which is in agreement with previously published findings. In goats adapted to HA, (Cl ion) in cerebral ISF remained equal to (Cl ion) in CSF, while (HCO3 ion) in cerebral ISF was demonstrably lower, and (lactate) presumably higher, than in CSF. The fluid surrounding the central chemoreceptors appears to be more acidic in goats acclimatized to HA than at SL, in spite of the alkalosis in cisternal CSF. This may contribute to ventilatory acclimatization to HA. Author (GRA)

N79-33789# Joint Publications Research Service, Arlington, Va.
SPACE BIOLOGY AND AEROSPACE MEDICINE, NO. 4, 1979
9 Oct. 1979 145 p refs Transl. into ENGLISH of Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 145 p
(JPRS-74330) Avail: NTIS HC A07/MF A01

Problems associated with spacecraft habitability are discussed with emphasis on the effects of radiation and weightlessness on physiological processes and chemical reactions in man, animals, and plants. For individual titles, see N79-33790 through N79-33814.

N79-33790# Joint Publications Research Service, Arlington, Va.
IMMUNOBIOLOGICAL REACTIVITY OF THE BODY UNDER HYPERBARIC AND HYPOBARIC CONDITIONS c52
A. S. Kaplanskiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 1-7 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 3-7 (For primary document see N79-33789 24-51)
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Data existing in the literature concerning the effects of hyperbaric and hypobaric gas mixtures on resistance to infections and immunobiological reactivity of the body are surveyed. Despite contradictory results obtained by different researchers, the exposure of man and animals to hyperbaric conditions in isolated chambers is associated with an increase in morbidity rate and the aggravation of infectious and inflammatory processes. The increased incidence of infectious diseases is apparently due to the depression of nonspecific resistance of the body as well as to the adverse hygienic conditions in pressure chambers. There is also reason to believe that impairment of immunity under hyperbaric conditions occurs as a result of the development of stress, the etiology of which is not clear, although overcooling of the body could be a factor. The limited number of studies dealing with the effects of hypobarism on resistance to infection, and the contradiction of the published data, preclude the derivation of any conclusions at present. A.R.H.

N79-33791# Joint Publications Research Service, Arlington, Va.
STUDIES OF VENOUS CIRCULATION IN THE CREW OF THE SALYUT-5 ORBITAL STATION c52
V. A. Degtyarev, A. S. Nekhayev, V. S. Bednenko, O. B. Kulikov, Ye. A. Kobzev, V. M. Bolshov, and A. A. Tsvetkov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 8-13 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 8-12 (For primary document see N79-33789 24-51)
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Measurements of venous circulation in the crewmembers of the orbital station Salyut-5 demonstrate weightlessness induced symptoms specifically associated with blood redistribution and pressure increase in the jugular veins. Further studies of venous circulation and regional hemodynamics are recommended to determine the time and degree of human body adaptation to weightlessness. A.R.H.

N79-33792# Joint Publications Research Service, Arlington, Va.
FLUID-ELECTROLYTE METABOLISM IN THE CREW OF SALYUT-4 c52
G. I. Kozyrevskaya, A. I. Grigoryev, B. R. Dorokhova, N. M. Vatulya, and N. D. Radchenko *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 14-21 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 12-18 (For primary document see N79-33789 24-51)
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Fluid-electrolyte metabolism was studied in two cosmonauts before and after completion of a 63-day orbital flight. Post flight weight losses of 5.6% and 3.5% were attributed to body dehydration. Both men showed a trend for an increased renal excretion of potassium, magnesium, and calcium as compared to their food intake, with increases being more expressed the day after the water load application. Possible causes of the changes

and the pattern of recovery of fluid-electrolyte metabolism after a prolonged space flight are discussed. A.R.H.

N79-33793# Joint Publications Research Service, Arlington, Va.

CONTROL OF VERTICAL POSITION AFTER FLIGHTS ABOARD THE SALYUT-4 ORBITAL STATION c52

V. I. Myasnikov, O. P. Kozerenko, N. M. Rudometkin, V. M. Mikhaylov, and V. S. Georgiyevskiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 22-27 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 18-22 (For primary document see N79-33789 24-51)

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The stabilography method, used on the crews of the Soyuz 4 and 5 spacecraft revealed an increase in amplitude and an undulant change in frequency of oscillations of the body's center of gravity. Post-flight studies of the crews of Soyuz 17 and 18 are discussed to demonstrate the distinctions of regulation of vertical position and autonomic reactions to it after prolonged weightlessness. The process of restoration of the initial level of control of the upright position is examined. A.R.H.

N79-33794# Joint Publications Research Service, Arlington, Va.

EFFECTS ON LIPID METABOLISM IN MAN OF SOME FACTORS THAT SIMULATE SPACE FLIGHT CONDITIONS c52

V. P. Bychkov, A. G. Kasatkina, and O. S. Khokhlova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 28-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 28-34 (For primary document see N79-33789 24-51)

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Studies of the effects of space flight simulation factors on lipid metabolism show that space diets developed for space flights of different duration (dehydrated foodstuffs alone or in combination with foods preserved by other methods) do not product noticeable changes in lipid metabolism. Nevertheless, other factors, i.e. hypokinesia, intake of nerobol during hypokinesia, an altered work-rest cycle, an increased carbon monoxide concentration (up to 15 mg/cu m) influenced lipid metabolism. Author

N79-33795# Joint Publications Research Service, Arlington, Va.

ELECTROLYTE COMPOSITION OF RAT BLOOD PLASMA AND SKELETAL MUSCLES AFTER FLIGHT ABOARD THE COSMOS-690 BIOSATELLITE

V. P. Nesterov and R. A. Tigranyan *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 35-39 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 35-39 (For primary document see N79-33789 24-51)

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Measurements of Na(+), K(+), Mg2(+) and Ca2(+) concentrations in the functionally different muscles (soleus, plantaris, diaphragm muscles) and plasma of the rats flown for 20.5 days aboard the biosatellite Cosmos-690 did not show any significant changes as compared with the controls. At the same time a decrease of the K(+)/Na(+) ratio and a similar shift of Mg2(+) and Ca2(+) concentrations in plasma of irradiated rats as compared with these of non-irradiated animals demonstrated that the combined effects of space flight factors and gamma-irradiation influenced the system of ionic homeostasis in the blood. In the animals sacrificed on the R + 1 day the K(+)/Na(+) ratio in the soleus muscle changed in favor of Na(+) and in the plantaris muscle in favor of K(+), and remained essentially unchanged in the diaphragm. Comparison of the flight experiments with the ground-based controls show that ion changes occur because of ionizing radiation rather than weightlessness. Author

N79-33796# Joint Publications Research Service, Arlington, Va.

INTENSITY OF DNA SYNTHESIS IN ANIMAL ORGANS AFTER FLIGHT ABOARD THE COSMOS-782 BIOSATELLITE

F. T. Guseynov, I. A. Yegorov, G. S. Komolova, and R. A. Tigranyan *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 40-44 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 30-33 (For primary document see N79-33789 24-51)

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At six hours postflight, the rate of tritiated thymidine incorporation into the liver of flight rats did not differ from normal (vivarium controls) and was 50% higher than in synchronous rats. In the spleen and thymus of flight animals, this parameter was 60% and 33% below the norm. Similar but less pronounced changes in the spleen were found in the synchronous rats. Twenty-five days postflight, the rate of DNA synthesis in lymph organs recovered completely and tended to increase, whereas in the liver it remained significantly below the norm. A.R.H.

N79-33797# Joint Publications Research Service, Arlington, Va.

EFFECT OF BRIEF HEAD-DOWN POSITION ON PARAMETERS OF CARBOHYDRATE METABOLISM AND BETA LIPOPROTEIN CONTENT OF BLOOD c52

A. A. Seid-Guseynov, V. Ye. Katkov, V. V. Chestukhin, L. I. Shefter, N. S. Zakharova, and Ya. A. Sokolov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 45-51 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 34-38 (For primary document see N79-33789 24-51)

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Before and after 5-day bed rest in the head-down position (at an angle of -4.5 deg), the healthy male test subjects were exposed to selective catheterization with blood samples withdrawn from different compartments of the cardiovascular system. The content of glucose, insulin, lactic acid and Beta-lipoproteins was measured. After bed rest the systemic circulation, mixed arterial and venous blood, showed a trend for a decrease of carbohydrate metabolism and an increase of the content of Beta-lipoproteins. Transcapillary metabolism in different organs, first of all, in the brain and liver altered significantly. The liver began to release glucose and ceased to utilize lactic acid whereas the brain increased substantially its release of Beta-lipoproteins. The data obtained were analyzed using a model of carbohydrate metabolism to control and artificial pancreas. Author

N79-33798# Joint Publications Research Service, Arlington, Va.

INFLUENCE OF PRESSURE CHAMBER CONDITIONS ON ADRENOCORTICAL FUNCTION IN MAN (ACCORDING TO RESULTS OF ASSAYING BLOOD PLASMA 11-HYDROXYCORTICOSTEROIDS) c52

S. Kalandarov, V. P. Bychkov, and A. V. Sergiyenko *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 52-57 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 39-42 (For primary document see N79-33789 24-51)

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The effect of a changed atmosphere, hypoxia, hypercapnia, their combinations and different motor activities on the adrenocortical function was studied in 36 test subjects kept in an 8 cu m altitude chamber. Human adaptation to the environmental changes developed with an active involvement of the adrenal cortex. The level and direction of the changes depended on both the force of the influences and on the initial state of the test subjects. Author

N79-33799# Joint Publications Research Service, Arlington, Va.

ENERGY EXPENDITURES OF MAN DURING LONG EXPOSURE TO A PERIODICALLY CHANGING ATMOSPHERE c52

N. A. Agadzhanyan, V. M. Baranov, M. A. Vytchikova, G. A. Davydov, and Yu. A. Spasskiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 58-63 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 42-46 (For primary document see N79-33789 24-51)

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The results of studying man's gas exchange and energy expenditures as related to the composition of a cyclically changing environment of an altitude chamber are presented. The experi-

ments were carried out on a 24-hour basis. The environmental parameters that physiologically were most adequate as the training factor are given. The respiratory reactions suggest that the enclosed environment used is suitable to prevent hypokinesia effects. G.Y.

N79-33800# Joint Publications Research Service, Arlington, Va.

DISTINCTIONS OF INFLUENCE OF THE RETICULAR FORMATION OF THE MIDBRAIN ON THE HEART AND RESPIRATION WITH EXPOSURE TO CENTRIPETAL ACCELERATIONS c52

L. D. Klimovskaya *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 64-70 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 46-50 (For primary document see N79-33789 24-51)

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Experiments were carried out on white rats and rabbits exposed to transverse accelerations of 6-10 g for 5 min. Before, during and after centrifugation the reticular formation of the midbrain underwent high-frequency electric stimulation. During centrifugation the inhibitory effects of the recticular formation on the cardiorespiratory rhythm decreased, whereas stimulatory effects either remained unchanged or increased. Author

N79-33801# Joint Publications Research Service, Arlington, Va.

SIGNIFICANCE OF THE VIBRATION COMPONENT TO THE DELETERIOUS EFFECT OF IMPACT ACCELERATIONS c54

G. P. Mirolyubov, V. A. Elivanov, and G. P. Stupakov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 71-76 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 51-54 (For primary document see N79-33789 24-51)

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Animal experiments demonstrated that damped oscillations of the support construction induced by impact accelerations enhanced their damaging effect on dogs. Within the frequency range tested (from 20 to 178 Hz) the threshold of lesions of the lungs, heart and liver decreased and reached 34% at a frequency of 85 Hz. The level of liver lesions was inversely proportional to the frequency of the support oscillations. Lesions of the lungs and the heart were more expressed at 85 Hz and decreased with an increase or a decrease of the oscillation frequency. At a frequency of 130-176 Hz the effect of the vibration component was not seen. Author

N79-33802# Joint Publications Research Service, Arlington, Va.

EFFECT OF RESTRICTED ACTIVITY ON VESTIBULAR FUNCTION c52

G. I. Gorgiladze, G. I. Samarin, and G. S. Kazanskaya *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 77-82 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 55-58 (For primary document see N79-33789 24-51)

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The hypokinetic effect on the nystagmic reaction and illusory sensations upon caloric and galvanic stimulations of the labyrinths was studied on six test subjects (professional gymnasts). Under normal conditions the sportsmen predominantly showed the nystagmic response to the caloric irritation of the left labyrinth. A 10-day hypokinetic exposure produced a noticeable decrease of the above asymmetric nystagmic reaction to the caloric irritation of both labyrinths. Simultaneously an enhancement of illusory sensations and a decrease of their thresholds in response to the direct current labyrinthine stimulation were noted. The above changes can be attributed to the hypokinesia-induced decline of mechanisms of vestibular adaptation of sportsmen. Author

N79-33803# Joint Publications Research Service, Arlington, Va.

EFFECT OF ROCKING ON ABSORPTION OF SOME GROUP B VITAMINS AND ASCORBIC ACID IN THE SMALL INTESTINE OF DOGS

R. P. Faytelberg and T. V. Gladkiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 83-88 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 59-62 (For primary document see N79-33789 24-51)

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On the dogs with a Thiry-Pavlov fistula (an isolated loop of the small intestine) the effect of 30-min acceleration on the absorption of thiamine-bromide, riboflavine, pyridoxine-hydrochloride and ascorbic acid as well as on the gastric juice secretion was studied. It was demonstrated that back-to-forth linear acceleration increased vitamin B1 absorption, decreased vitamins B2 and B6 and ascorbic acid absorption, and altered secretion of gastric juice. Author

N79-33804# Joint Publications Research Service, Arlington, Va.

ULTRASTRUCTURE OF LYMPH NODES OF DOGS EXPOSED TO LONG-TERM EXTERNAL GAMMA RADIATION

V. V. Shikhodyrov, L. A. Bespalova, and V. S. Romanov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 89-93 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 62-66 (For primary document see N79-33789 24-51)

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An electron microscopy study of lymph nodes of dogs exposed to chronic gamma-irradiation during 6 years (with a total dose of 125 rad/year) was performed. The exposure induced changes in the cell composition of the paracortical regions due to a decrease of the count of small lymphocytes and a predominant increase of young blast cells with an altered ultrastucture. Chronic gamma-irradiation led to an increase of the number of plasma cells and emergence of intermediate cell forms due to plasmatization of lymphocytes and reticular cells. G.Y.

N79-33805# Joint Publications Research Service, Arlington, Va.

SOME OF THE PROBLEMS INVOLVED IN PLANNING BIOLOGICAL EXPERIMENTS

V. V. Verigo *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 94-99 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 66-69 (For primary document see N79-33789 24-51)

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Certain cases of using mathematical methods in the planning of biological experiments are described. The paper presents an algorithm of the distribution of the experimental data based on dynamic programming. An application of computer-aided calculations for the formation of homogeneous groups of experimental and control tests is discussed. G.Y.

N79-33806# Joint Publications Research Service, Arlington, Va.

ADAPTIVE OPTIMIZATION OF EXCHANGE OF GASES IN PLANTS IN A SEALED PHYTOTRON

Yu. A. Berkovich, V. L. Korbut, and O. B. Suslova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 100-104 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 70-73 (For primary document see N79-33789 24-51)

Avail: NTIS HC A07/MF A01

The study of adaptive optimization of wheat photosynthetic productivity in the phytotron allowed a 25-100% increase in the daily volumes of carbon dioxide assimilated by plants. Author

N79-33807# Joint Publications Research Service, Arlington, Va.

QUALITY OF WATER RECLAIMED FROM URINE AS RELATED TO pH OF INITIAL PRODUCT c54

N. M. Nazarov, I. V. Yakimova, N. A. Golikova, Yu. Ye. Sinyak, and S. V. Chizhov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 105-108 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 73-76 (For primary document see N79-33789 24-51)

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It was demonstrated that the quality of reclaimed water depends on pH of initial urine: the water reclaimed by evaporation

at temperatures not higher than 50 C shows higher content of ammonium nitrogen and better oxygenation at pH 3-5. G.Y.

N79-33808# Joint Publications Research Service, Arlington, Va.
EVALUATION OF OXIDIZABILITY OF AIR IN CLOSED AREAS **c54**
L. A. Mokhov, L. D. Karpova, and N. Ya. Shuinova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 109-112 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 76-78 (For primary document see N79-33789 24-51)
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Acetic acid, aldehydees, as well as a number of other organic substances, are the natural products of human vital functions, and they are released into the environment with exhaled air, sweat, urine, excrements, etc. In the air of a small, closed area, these organic compounds as a whole could induce discomfort, associated with a number of unpleasant sensations (odor, nausea, vertigo, headache, etc.). Heretofore, air oxidability was determined according to the organic impurities capable of oxidation to acetic acid or acetaldhyde, and as a result a number of compounds were overlooked. For this reason, when making a sanitary chemical evaluation of air in closed areas of a limited size, if possible, organic impurities to carbon dioxide must be oxidized. The influence of duration of reaction, acidity of medium, heating conditions and use of catalysts on the reaction of oxidation of ethanol were tested. G.Y.

N79-33809# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYDROSTATIC FACTOR ON ORTHOSTATIC STABILITY AND PHYSICAL FITNESS OF MAN DURING 60-DAY ANTIORTHOSTATIC HYPOKINESIA **c52**
O. D. Anashkin, Z. K. Trushinskiy, F. V. Reva, and T. P. Shatunina *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 113-115 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 78-80 (For primary document see N79-33789 24-51)
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Six essentially healthy male volunteers participated in the studies (age ranged from 19 to 37). Three subjects (control group) were kept on strict bed rest in antiorthostatic (head down) position, with the head of the bed tilted -4.5 deg down, for 60 days. The other three subjects spent 2 hours/day in sitting position (1 hour after breakfast and 1 hour after lunch-dinner), and the remaining 22 hours were spent in the anteriorthostatic position. Heart rates and arterial pressures were recorded and physical fitness was evaluated. G.Y.

N79-33810# Joint Publications Research Service, Arlington, Va.
VERTICAL ORIENTATION OF MAN DURING 5-DAY ANTIORTHOSTATIC HYPOKINESIA (-4, -8 AND -12 DEG HEAD DOWN POSITION) **c52**
B. B. Bokhov and Yu. N. Taranenko *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 116-120 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 80-83 (For primary document see N79-33789 24-51)
Avail: NTIS HC A07/MF A01

Two tests were used to study the effect of 5-day hypokinesia on vestibuloproprioceptive orientation: orientation in a field of vision without a reference point and in a field with an image. G.Y.

N79-33811# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMPACT ACCELERATIONS ON CHEMICAL RESISTANCE OF RAT ERYTHROCYTES
Ye. Ye. Simonov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 121-124 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 83-85 (For primary document see N79-33789 24-51)
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Experiments were conducted on 36 male albino rats weighing 150-180 g, which were divided into three equal groups. The 1st group was exposed to landing impact accelerations of 410 + or - 50 units at a collision rate of 10 m/s; the 2d group was exposed to accelerations of 760 + or - 50 units at the same collision rate. The accelerations were in the back--chest direction. Blood was taken for tests from the tail before the experiment, then 1, 2 and 3 days after it. Chemical resistance of erythrocytes was determined by a modified method of acid erythrograms. Concurrently, determination was made of total erythrocyte count and hemoglobin content thereof. G.Y.

N79-33812# Joint Publications Research Service, Arlington, Va.
EXTERNAL RESPIRATION AND GAS EXCHANGE REACTIONS OF MAN DURING ROTATION ON A SHORT-ARM CENTRIFUGE **c52**
O. L. Golovkina *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 125-126 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 85-86 (For primary document see N79-33789 24-51)
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The reactions of the human external respiration system and gas exchange were studied during exposure to accelerations and combination thereof with exercise on a bicycle ergometer, using a short-radius centrifuge. G.Y.

N79-33813# Joint Publications Research Service, Arlington, Va.
BLOOD COAGULATION AND TISSULAR FACTORS OF BLOOD CLOTTING IN HEPARINIZED RABBITS SUBMITTED TO HYPOKINESIA
L. P. Suiridkina, V. I. Inchina, and Yu. I. Grinevskaya *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 129-132 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 87-89 (For primary document see N79-33789 24-51)
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Some investigators report an increase in blood clotting potential at the early stages of hypokinesia. On this basis, the blood clotting system and coagulant properties of the wall of the aorta, venae cavae and myocardium during brief, strict immobilization of rabbits were studied against the background of giving them heparin, which has a marked hypocoagulant action. G.Y.

N79-33814# Joint Publications Research Service, Arlington, Va.
THIRD SYMPOSIUM ON MOTION SICKNESS **c52**
G. L. Komendantov and A. G. Bystrova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 133-135 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 89-90 Symp. held at Moscow, 21-22 Nov. 1978 (For primary document see N79-33789 24-51)
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The third symposium on the problem of motion sickness was held in Moscow, on 21-22 November 1978, in accordance with the work schedule of the section of aviation and space medicine of the Moscow department of the All-Union Society of Physiologists. A total of 173 people participated in the work of the symposium, referable to scientists, practicing physicians and specialists from 18 cities of the Soviet Union. The agenda topics were pathogenesis of motion sickness, questions of expertise and pharmacological prevention. G.Y.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N79-33815 California Inst. of Tech., Pasadena.
METHODS FOR LOCALIZATION OF ELECTRICAL SOURCES IN THE HUMAN BRAIN AND APPLICATIONS TO THE VISUAL SYSTEM **Ph.D. Thesis**
Terrance Michael Darcey 1979 320 p
Avail: Univ. Microfilms Order No. 7920351

Multichannel human visual evoked scalp potential (VESP)

recording was combined with results from electric field theory and the methods of nonlinear parameter estimation to see if it was possible to infer the general spatio-temporal course of brain excitation in the processing of a visual stimulus. Various models of the head and underlying sources were tested. Forty Channel VESP measurements were made to briefly appearing checkerboard patterns placed in various areas of the visual field. These data were analyzed in terms of underlying equivalent sources in the brain. The measured potential distributions showed a radical dependence of VESP topography on stimulus locus and indicated that these VESP's are probably volume-conducted field effects arising from a small number of fairly localized sources in the brain. Dissert. Abstr.

N79-33816 Polytechnic Inst. of New York.
ACOUSTIC ATTITUDE ORIENTATION Ph.D. Thesis
Bjorn Jay Matz 1979 138 p
Avail: Univ. Microfilms Order No. 7920790

The phenomenon of acoustical tracking in a multi-axis task was investigated in order to determine whether man's audio system can discriminate or resolve two axes of simultaneous acoustic inputs sufficiently well to acoustically track at least as well as his visual system can track visually. The specific task for this investigation was flying an airplane. The results show that in almost all cases, flying using acoustical instrumentation is as good, or better than, flying with visual instrumentation under the first three out of four turbulence levels tested. At the fourth level of turbulence (severe), the results of individual parameters are mixed, but flying with visual instrumentation is slightly better than flying with acoustical instrumentation, but the result is not statistically significant. Dissert. Abstr.

N79-33817 Rice Univ., Houston, Tex.
A NONLINEAR MAPPING APPROACH TO DISCRIMINATION OF SLEEP STAGES FROM THE HUMAN ELECTROENCEPHALOGRAM Ph.D. Thesis
Roderick Pruett 1979 138 p
Avail: Univ. Microfilms Order No. 7919622

New nonlinear analysis techniques were developed for the discrimination of seven sleep stages from the eight lead human electroencephalogram (EEG). The EEG was preprocessed using Period Analysis. Then, appropriate descriptive measures were derived such that discriminant analysis techniques were able to automatically obtain appropriate classifications of sleep EEG samples. Cluster analysis was used to study the similarities and dissimilarities of sleep EEG samples. A nonlinear dimension reduction algorithm was then used to create a two dimensional (2 D) representation of the multi-dimensional (40 D) data set. Dissert. Abstr.

N79-33818* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 197, SEPTEMBER 1979
Sep. 1979 64 p
(NASA-SP-7011(197)) Avail: NTIS HC E03 CSCL 06E

This bibliography lists 193 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1979. Author

N79-33819# Civil Aeromedical Inst., Oklahoma City, Okla.
EFFECTS OF CONGENER AND NONCONGENER ALCOHOLIC BEVERAGES ON A CLINICAL ATAXIA TEST BATTERY
David J. Schroeder (Veterans Administration Hospital, Topeka, Kansas) and William E. Collins Jan. 1979 19 p refs
(AD-A069375; FAA-AM-79-9) Avail: NTIS HC A02/MF A01 CSCL 06/20

The performance of normally 'heavy' and normally 'light' young male drinkers on an ataxia test battery before and after drinking either a high congener (bourbon) or low congener (vodka) alcoholic beverage was investigated. To assess possible long term effects of alcohol, testing was conducted 1, 3, 5, 9, 24, and 32 hours after drinking. With the exception of one walking test that showed inferior performance 1 hour after drinking and recovery thereafter, the measures of the ataxia test battery were about equally affected, showing decrements from 1 to 3 hours after drinking and a return to a normal plateau by the fifth postdrinking hour. Normally heavy drinkers tended to display less ataxia following drinking than did normally light drinkers. Comparisons of the low and high congener beverages failed to reveal any significant differential effects. There were also no indications of any significant impairment on ataxia tests during the hangover period. R.E.S.

N79-33820# Civil Aeromedical Inst., Oklahoma City, Okla.
LABORATORY PERFORMANCE DURING ACUTE INTOXICATION AND HANGOVER
William E. Collins and W. Dean Chiles Feb. 1979 30 p refs
(AD-A069373; FAA-AM-79-7) Avail: NTIS HC A03/MF A01 CSCL 06/16

Eleven private pilots (7 men and 4 women) were recruited and trained on the multiple task performance battery (MTPB), static and dynamic tracking of a localizer/glide slope instrument, a speech intelligibility test (single words with a background of aircraft noise), and use of the intoxilyzer. The experiment comprised four test sessions (vodka, bourbon, placebo, and control sessions) held at weekly intervals. Results showed clear deleterious effects of alcohol on the MTPB and the tracking tasks immediately following drinking. During the morning (hangover) tests, scores on the MTPB and on the static and dynamic tracking tasks showed small circadian effects (scores were better) without impairment due to the alcohol. Speech perception scores were unaffected by alcohol; scores were always best in the evening and poorest in the morning. There were no congener effects. These results thus offer no evidence contrary to the 'eight hour rule'. Author

N79-33821# Civil Aeromedical Inst., Oklahoma City, Okla.
DEVELOPMENT OF ELECTROPHYSIOLOGICAL INDICES OF NEUROLOGICAL TOXICITY FOR ORGANOPHOSPHATE PESTICIDES AND DEPRESSANT DRUGS
A. M. Revzin May 1979 18 p refs
(AD-A070299; FAA-AM-79-15) Avail: NTIS HC A02/MF A01 CSCL 06/20

The effects of certain drugs and environmental pollutants on brain mechanisms controlling these visual reflexes were investigated using single nerve cell recordings in animal model systems. Most agents studied deleteriously affected reflex functions at extremely low doses. This was especially true for organophosphate pesticides, related cholinergic compounds, and ethyl alcohol. Some drugs, such as imipramine and amphetamine, seemed to have little deleterious effect. Overall, the results suggest that some drugs and environmental pollutants can impair visual functions at doses not normally considered hazardous, and thus indicate the need for extreme caution in evaluating the safety margins of such materials in aviation medicine. R.E.S.

N79-33822*# National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL AND THEORETICAL INVESTIGATIONS CONCERNING A FREQUENCY FILTER BEHAVIOR OF THE HUMAN RETINA REGARDING ELECTRIC PULSE CURRENTS Ph.D. Thesis
A. Meier-Koll Sep. 1979 58 p refs Transl. into ENGLISH from experimentelle und theoretische untersuchungen ueber ein frequenzfilterverhalten der menschlichen retina gegenveber electrischen impulsstroemen, Tech. Hochschule, Fak. fuer Maschinenwesen und Electrotech., (Munich) 1970 p 90 Original language doc. was announced as A71-14372 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75372) Avail: NTIS HC A04/MF A01 CSCL 06P

Investigation involving patients with injuries in the visual nervous system are discussed. This led to the identification of the epithelial ganglion of the retina as a frequency filter. Threshold curves of the injured visual organs were compared with threshold curves obtained with a control group as a basis for identification. A model which considers the epithelial ganglion as a homogeneous cell layer in which adjacent neurons interact is discussed. It is shown the behavior of the cells against alternating exciting currents can be explained. R.E.S.

N79-33823*# National Aeronautics and Space Administration, Washington, D. C.

CONTRIBUTION TO THE THEORY OF PHOTOPIC VISION: RETINAL PHENOMENA

H. Calvet Sep. 1979 13 p Transl. into ENGLISH from Sci. Tech. (Paris), 15 Oct. 1974 p 13-17 Original language document announced as A75-17025 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75507) Avail: NTIS HC A02/MF A01 CSCL 06P

Principles of thermodynamics are applied to the study of the ultramicroscopic anatomy of the inner eye. Concepts introduced and discussed include: the retina as a three-dimensional sensor, light signals as coherent beams in relation to the dimensions of retinal pigments, pigment effects topographed by the conjugated antennas effect, visualizing lights, the autotropic function of hemoglobin and some cytochromes, and reversible structural arrangements during photopic adaptation. A paleoecological diagram is presented which traces the evolution of scotopic vision (primitive system) to photopic vision (secondary system) through the emergence of structures sensitive to the intensity, temperature, and wavelengths of the visible range. Author

N79-33824# Weather Wing (5th), Langley AFB, Va.

MINIMUM SEA SURFACE TEMPERATURES AND ASSOCIATED SURVIVAL TIMES Final Report

Gerald L. Wheeler May 1979 30 p Supersedes Rept-5WW-SS-319

(AD-A070162; Rept-5WW-TN-79-001; Rept-5WW-SS-319) Avail: NTIS HC A03/MF A01 CSCL 06/19

This technical note contains sea-surface isotherm charts, showing the approximate survival times of humans immersed in the waters of the North Atlantic and North Pacific Oceans. Minimum sea-surface temperatures are based on the 95th (North Atlantic) and 97.5th (North Pacific) percentiles. GRA

N79-33825# Texas Univ. at Austin. Bio-Medical Engineering Research Lab.

MEASUREMENTS IN THE LASER IRRADIATED EYE Final Report, 1 Apr. 1977 - 31 Mar. 1978

Ashley J. Welch and Larry D. Forster 15 Nov. 1978 78 p refs

(Grant AF-AFOSR-3314-77; AF Proj. 2312)

(AD-A069842; AFOSR-79-0672TR) Avail: NTIS HC A05/MF A01 CSCL 06/18

The work involves the fabrication and use of a small fiber optic probe to measure (1) the transmission of the ocular media which is the ratio of the total light intensity reaching the retina to the total light intensity incident on the cornea, and (2) the cross-sectional intensity profile of a minimally small image. Information concerning the resolution of the eye is derived from the small image measurements. The transmission of the ocular media, measured on a limited number of animals, compares well with some of the best previously reported data. The transmission was measured via a 600 micron diameter fiber optic probe which collected all the light from a 200 micron diameter irradiating laser beam. Three lasers, providing seven wavelengths, were employed. The minimal images measured in the monkey eye were larger than values reported from subjective acuity tests or by diffraction theory. Some of this poor quality could be attributed to experimental error, but perhaps the most significant factor affecting eye quality was the fact that the neural controls for blinking, tearing, and micro-accommodation, which aid the eye in forming a retinal image, were inactive in the anesthetized animal. GRA

N79-33826# Franklin Research Center, Philadelphia, Pa. Science Information Services Organization.

BIOLOGICAL EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION, VOLUME 3, NUMBER 4 Quarterly Report, Mar. - Jun. 1979

Jun. 1979 71 p refs Sponsored by the Navy and Nat. Telecommun. and Inform. Admin.

(AD-A070242; Rept-80G-C5003-01-Vol-3-No-4) Avail: NTIS HC A04/MF A01 CSCL 06/18

This quarterly digest presents current awareness information on the biological effects of nonionizing electromagnetic radiation (microwave and radio frequency) in the range of 0 Hz to 100 GHz. The effects of magnetic and electric fields (static and alternating) are also covered. Each issue contains abstracts of English and foreign current literature, summaries of ongoing research investigations, news items, and a directory of meetings and conferences. GRA

N79-33827# Texas Univ. at Galveston. Marine Biomedical Inst.

FUNDAMENTAL BIOPHYSICAL ASPECTS OF DECOMPRESSION SICKNESS Final Report, 1 May 1975 - 31 May 1979

Brian A. Hills 1 Jun. 1979 13 p refs

(Contract N00014-75-C-1035)

(AD-A069998) Avail: NTIS HC A02/MF A01 CSCL 06/19

The work described in this report is directed at determining the physiological and physical factors which underly the formulation of safe decompression procedures. Some aspects are continuations of studies initiated by the principal investigator at Duke University under contract N00014-67-A-0251-0015. Almost all of the work has been published or is currently in press and a full list of publications arising from these contracts is appended to this report. This report summarizes the results and then goes on to describe the way in which the principal investigator now envisages decompression sickness and its prevention in the light of these and other published studies. GRA

N79-33828# Rochester Univ., N. Y. School of Medicine and Dentistry.

STUDIES OF METABOLISM, FUNCTION AND MECHANISM OF DESTRUCTION OF RED CELLS Final Report, 1 Jul. 1973 - 31 Mar. 1978

Marshall A. Lichtman, Robert I. Weed, Paul L. LaCelle, and Jules Cohen Apr. 1978 44 p refs

(Contract DADA17-73-C-3135)

(AD-A070240) Avail: NTIS HC A03/MF A01 CSCL 06/16

We have studied the effects of propranolol on hemoglobin-oxygen affinity and red cell shape, both in vitro and in vivo. We have also examined the effects of hemodialysis on red cell organic phosphates and on oxygen-binding to hemoglobin. Studies were conducted on the role of blood pH alterations in the elevation of red cell 2,3-DPG and decrease in hemoglobin-oxygen affinity observed in subjects with hypoproliferative anemia. Studies of the interactions of anemia, red cell ATP concentration and changes in plasma inorganic phosphate have been conducted. The interrelationships of red cell magnesium concentration and ATP concentration on hemoglobin oxygen binding have been performed. We have studied patients with acute myocardial infarction and have found that whole blood oxygen consumption remains constant despite a nearly three-fold variation in arterial oxygen flow rate. We calculated that a reduction in hemoglobin oxygen affinity could explain about one-third of the increased extraction of oxygen required to maintain oxygen consumption. Other, probably, tissue compensating mechanisms must account for the remaining adaptation. We have studied water soluble radiographic contrast materials and have found them to produce a significant alteration in the distribution of irons across the red cell membrane. GRA

N79-33829# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

THE RELATIONSHIP BETWEEN AEROBIC FITNESS AND CARDIOVASCULAR RISK FACTORS IN THE CANADIAN FORCES

T. E. Brown, W. S. Myles, and C. L. Allen Mar. 1979 18 p refs

(AD-A069865; DCIEM-TR-79X11) Avail: NTIS HC A02/MF A01 CSCL 06/14

Aerobic fitness and the incidence of risk factors related to cardiovascular disease (CVD) were compared for 1595 Canadian servicemen 20-50 years of age. Aerobic power (V02 max) was predicted from heart rates during submaximal exercise performed on a bicycle ergometer. The risk factors, body fat, serum cholesterol, serum triglycerides and blood pressure were measured by standard procedures. Smoking histories were obtained by questionnaire. A positive relationship was demonstrated between V02 max and all of the CVD risk factors examined. This relationship was most significant among those over 40 years of age, the age group most at risk from CVD. The validity of this and other

studies relating aerobic fitness to susceptibility to CVD is discussed. GRA

N79-33830# Tuskegee Inst., Ala. Dept. of Physics.
ANALYTICAL MODELLING OF LOAD-DEFLECTION BEHAVIOR OF INTERVERTEBRAL DISCS SUBJECTED TO AXIAL COMPRESSION Final Research Report, 1 Apr. 1971 - 31 May 1979
Marshall L. Burns May 1979 26 p refs
(Contract AF-AFOSR-3578-78; AF Proj. 2312)
(AD-A071019; AFOSR-79-0795TR) Avail: NTIS HC A03/MF A01 CSCL 06/16

The analytical modelling of creep response phenomena of intervertebral discs subjected to a constant axial compressive load is attempted by using Kelvin-solid models. A mathematical analysis scheme is proposed for unique model identification wherein exact parameter solutions are developed for the one-Kelvin-unit model, the three-parameter-solid model, and the two-Kelvin-unit model. In addition, a method is presented by which the associated Young's moduli and viscosity coefficients for an identified model are obtainable. Most importantly, unique parameter values are obtained for the three-parameter-solid by utilizing exact model parameter solutions on experimental strain, E (t), data. This particular model is observed to yield theoretical strain, E (t)cal, values that are within an average error of 3.48% of the experimentally measured values, E (t)exp, for different intervertebral discs. Further, mechanical properties of the intervertebral discs are obtained by using the values of the three-parameter-solid model parameters to calculate the associated Young's moduli and viscosity coefficient. The appropriate applications, data limitations, and possible generalizations of this exact analysis scheme are fully discussed, along with suggestions for future investigatory efforts. GRA

N79-33831# Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.
METABOLIC AND PHYSICAL SCALING IN MICROWAVE/RADIOFREQUENCY BIOEFFECTS STUDIES
S. M. Michelson and S. T. Lu 1979 4 p refs Presented at the Bioelectromagnetics Symp., Seattle, 18 Jun. 1979
(Contract EY-76-C-02-3490)
(UR-3490-1561; Conf-790627-3) Avail: NTIS HC A02/MF A01

The absorbed energy required to cause deleterious changes in body functions of experimental animals were determined through quantitative evaluation and comparison of the many experiments which have been conducted. The results of animal experiments were then extrapolated to the exposure conditions of man. Data obtained on dogs, rabbits, and rats exposed to 2880 MHz and 1280 MHz, pulsed and 200 MHz CW were reevaluated in the light of more recent concepts related to specific absorption rates. DOE

N79-33832# Equitable Environmental Health, Inc., Rockville, Md.
FEASIBILITY OF AN EPIDEMIOLOGICAL STUDY OF WORKERS OCCUPATIONALLY EXPOSED TO HIGH VOLTAGE ELECTRIC FIELDS IN THE ELECTRIC POWER INDUSTRY Final Report
H. M. D. Utidjian Mar. 1979 31 p refs
(EPRI Proj. TPS 76-639)
(EPRI-EA-1020) Avail: NTIS HC A03/MF A01

This feasibility study was conducted for the Electric Power Research Institute to investigate the practicality of an epidemiological study on workers occupationally exposed to high voltage electric fields. Identification of a target population to be studied, examination of the various epidemiologic methods which could be undertaken, and cost estimates were the objectives. As an initial step to address these issues, a sample questionnaire was sent to several utility companies. Tentative recommendations regarding possible approaches and specific cost estimates and time projections were stated. DOE

N79-33833# California Univ., Berkeley. Lawrence Berkeley Lab.
EFFECTS ON POPULATIONS OF EXPOSURE TO LOW LEVELS OF IONIZING RADIATION: IMPLICATIONS FOR NUCLEAR ENERGY AND MEDICAL RADIATION The 1979 Report of the Advisory Committee on the Biological Effects of Ionizing Radiation (the BEIR Report)
J. I. Fabrikant Apr. 1979 46 p refs Presented at Symp. on Known Effects of Low Level Radiation Exposure, Pittsburgh, Penn., 25 Apr. 1979 Sponsored in part by EPA
(Contract W-7405-eng-48)
(LBL-9084; Conf-790474-1) Avail: NTIS HC A04/MF A01

The following aspects of the 1979 BEIR report are described: societal decision-making; nuclear energy needs and medical care services; epidemiological and experimental studies; public acceptance; concept of risks to health; risk estimates and cost-benefit analysis; and comparison of risks. Other topics discussed are as follows: need for advisory committees on radiation; value of the BEIR report; health effects of low levels of ionizing radiation; determination of radiation risk estimates; and quantitation of radio-induced cancer risk estimates. DOE

N79-33834# California Univ., Berkeley. Lawrence Berkeley Lab.
HEALTH EFFECTS OF LOW-LEVEL IONIZING RADIATION
J. I. Fabrikant Apr. 1979 10 p
(Contract W-7405-eng-48)
(LBL-9018) Avail: NTIS HC A02/MF A01

Possible hazards to health of persons exposed to low level ionizing radiation are discussed; specifically, effects following exposure to x-rays and to gamma rays from radioactive sources, since these are the ionizing radiations most often encountered in medicine and in industry. There are a number of biological effects of ionizing radiations, but the three most important health effects are: carcinogenic, teratogenic and genetic. Conclusions on the health effects are presented. R.E.S.

N79-33835# Forschungsinstitut fuer Anthropotechnik, Meckenheim (West Germany).
INFLUENCE OF LIGHT ADAPTATION ON DARK ADAPTATION TIME FOR PATTERN RECOGNITION TASKS [EINFLUSS DER ART DER HELLADAPTATION AUF DEN DUNKELADAPTATIONSVERLAUF BEI FORMERKENNUNGSAUFGABEN]
E. Schubert Sep. 1977 62 p refs In GERMAN
(FB-31) Avail: NTIS HC A04/MF A01; Forschungsinst. fuer Anthropotech., Meckenheim, West Ger. DM 10

Night vision parameters such as acuity, adaptation, and accomodation were investigated. Physiological aspects of night vision together with eye/telescope interaction characteristics were studied. The effects of color, relative foreground/background illumination levels, and brightness levels, as well as choice of subjects (ships officers) for these experiments are discussed. Experimental setups used to simulate real conditions are described and results are graphically reported. Author (ESA)

N79-33836# National Bureau of Standards, Washington, D. C.
ULTRASONIC TISSUE CHARACTERIZATION II
Melvin Linzer Apr. 1979 346 p refs Presented at Intern. Symp. on Ultrasonic Tissue Characterization, 2d, Gaithersburg, Md., 13-15 Jun. 1977 Sponsored in part by NSF and NIH
(PB-296356/9; NBS-SP-525; LC-79-600026) Avail: NTIS HC A15/MF A01 CSCL 06E

The Second International Symposium on Ultrasonic Imaging and Tissue Characterization was held at the National Bureau of Standards on June 13-15, 1977. The meeting was cosponsored by the National Bureau of Standards, the National Science Foundation, and the National Institutes of Health. This volume contains extended and reviewed papers based on 43 of the 53 talks presented at the symposium. Topics covered include techniques for measurement of ultrasonic tissue parameters, the dependence of tissue properties on physical and biological variables (e.g., ultrasonic frequency, temperature), mechanisms of ultrasonic tissue interactions, propagation through bone and skull, tumor Doppler signatures, computerized tomography, signal processing and pattern recognition, and tissue phantoms. A survey of velocity and attenuation data in mammalian tissue is included. GRA

N79-33837# National Technical Information Service, Springfield, Va.
HYPERBARIC OXYGENATION. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jun. 1979

Elizabeth A. Harrison Jul. 1979 169 p Supersedes NTIS/PS-78/0676, NTIS/PS-77/0600, NTIS/PS-76/0526, and NTIS/PS-75/236
(NTIS/PS-79/0744/7; NTIS/PS-78/0676; NTIS/PS-77/0600; NTIS/PS-76/0526; NTIS/PS-75/236) Avail: NTIS HC $28.00/MF $28.00 CSCL 06S

Microbiology, respiratory infections, oxygen toxicity, diving, decompression sickness, and metabolism as applied to hyperbaric oxygenation are covered in the citations. This updated bibliography contains 160 abstracts, 4 of which are new entries to the previous edition. GRA

N79-33790# Joint Publications Research Service, Arlington, Va.
IMMUNOBIOLOGICAL REACTIVITY OF THE BODY UNDER HYPERBARIC AND HYPOBARIC CONDITIONS
A. S. Kaplanskiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 1-7 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 3-7 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33791# Joint Publications Research Service, Arlington, Va.
STUDIES OF VENOUS CIRCULATION IN THE CREW OF THE SALYUT-5 ORBITAL STATION
V. A. Degtyarev, A. S. Nekhayev, V. S. Bednenko, O. B. Kulikov, Ye. A. Kobzev, V. M. Bolshov, and A. A. Tsvetkov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 8-13 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 8-12 (For primary document see N79-33789 24-51)
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N79-33792# Joint Publications Research Service, Arlington, Va.
FLUID-ELECTROLYTE METABOLISM IN THE CREW OF SALYUT-4
G. I. Kozyrevskaya, A. I. Grigoryev, B. R. Dorokhova, N. M. Vatulya, and N. D. Radchenko *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 14-21 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 12-18 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33793# Joint Publications Research Service, Arlington, Va.
CONTROL OF VERTICAL POSITION AFTER FLIGHTS ABOARD THE SALYUT-4 ORBITAL STATION
V. I. Myasnikov, O. P. Kozerenko, N. M. Rudometkin, V. M. Mikhaylov, and V. S. Georgiyevskiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 22-27 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 18-22 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33794# Joint Publications Research Service, Arlington, Va.
EFFECTS ON LIPID METABOLISM IN MAN OF SOME FACTORS THAT SIMULATE SPACE FLIGHT CONDITIONS
V. P. Bychkov, A. G. Kasatkina, and O. S. Khokhlova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 28-34 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 28-34 (For primary document see N79-33789 24-51)
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N79-33797# Joint Publications Research Service, Arlington, Va.
EFFECT OF BRIEF HEAD-DOWN POSITION ON PARAMETERS OF CARBOHYDRATE METABOLISM AND BETA LIPOPROTEIN CONTENT OF BLOOD
A. A. Seid-Guseynov, V. Ye. Katkov, V. V. Chestukhin, L. I. Shefter, N. S. Zakharova, and Ya. A. Sokolov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 45-51 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 34-38 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33798# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF PRESSURE CHAMBER CONDITIONS ON ADRENOCORTICAL FUNCTION IN MAN (ACCORDING TO RESULTS OF ASSAYING BLOOD PLASMA 11-HYDROXYCORTICOSTEROIDS)
S. Kalandarov, V. P. Bychkov, and A. V. Sergiyenko *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 52-57 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 39-42 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33799# Joint Publications Research Service, Arlington, Va.
ENERGY EXPENDITURES OF MAN DURING LONG EXPOSURE TO A PERIODICALLY CHANGING ATMOSPHERE
N. A. Agadzhanyan, V. M. Baranov, M. A. Vytchikova, G. A. Davydov, and Yu. A. Spasskiy *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 58-63 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 42-46 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33800# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS OF INFLUENCE OF THE RETICULAR FORMATION OF THE MIDBRAIN ON THE HEART AND RESPIRATION WITH EXPOSURE TO CENTRIPETAL ACCELERATIONS
L. D. Klimovskaya *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 64-70 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 46-50 (For primary document see N79-33789 24-51)
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N79-33802# Joint Publications Research Service, Arlington, Va.
EFFECT OF RESTRICTED ACTIVITY ON VESTIBULAR FUNCTION
G. I. Gorgiladze, G. I. Samarin, and G. S. Kazanskaya *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 77-82 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 55-58 (For primary document see N79-33789 24-51)
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N79-33809# Joint Publications Research Service, Arlington, Va.
EFFECT OF HYDROSTATIC FACTOR ON ORTHOSTATIC STABILITY AND PHYSICAL FITNESS OF MAN DURING 60-DAY ANTIORTHOSTATIC HYPOKINESIA
O. D. Anashkin, Z. K. Trushinskiy, F. V. Reva, and T. P. Shatunina *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 113-115 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 78-80 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33810# Joint Publications Research Service, Arlington, Va.
VERTICAL ORIENTATION OF MAN DURING 5-DAY ANTIORTHOSTATIC HYPOKINESIA (-4, -8 AND -12 DEG HEAD DOWN POSITION)
B. B. Bokhov and Yu. N. Taranenko *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 116-120 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 80-83 (For primary document see N79-33789 24-51)
Avail: NTIS HC A07/MF A01

N79-33812# Joint Publications Research Service, Arlington, Va.
EXTERNAL RESPIRATION AND GAS EXCHANGE REACTIONS OF MAN DURING ROTATION ON A SHORT-ARM CENTRIFUGE
O. L. Golovkina *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 125-126 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 85-86 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33814# Joint Publications Research Service, Arlington, Va.
THIRD SYMPOSIUM ON MOTION SICKNESS
G. L. Komendantov and A. G. Bystrova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 133-135 Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 89-90 Symp. held at Moscow, 21-22 Nov. 1978 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N79-33838*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MODELS OF HUMAN OPERATORS IN VISION DEPENDENT TASKS
Marvin C. Waller, ed. Oct. 1979 86 p refs Seminars held at the Human Factors Soc. 1979 Ann. Meeting, Boston, 29 Oct. - 1 Nov. 1979; sponsored in part by Human Factors Soc. Visual Performance Tech. Group
(NASA-CP-2103; L-13338) Avail: NTIS HC A05/MF A01 CSCL 05J

Descriptive overviews of some existing models and techniques of modelling the human operator are presented. For individual titles, see N79-33839 through N79-33843.

N79-33839*# Applied Psychological Services, Wayne, Pa.
A SURVEY OF APPLIED PSYCHOLOGICAL SERVICES' MODELS OF THE HUMAN OPERATOR
Arthur I. Siegel and J. Jay Wolf *In* NASA. Langley Res. Center Models of Human Operators in Vision Dependent Tasks Oct. 1979 p 1-18 refs (For primary document see N79-33838 24-53)
Avail: NTIS HC A05/MF A01 CSCL 05H

A historical perspective is presented in terms of the major features and status of two families of computer simulation models in which the human operator plays the primary role. Both task oriented and message oriented models are included. Two other recent efforts are summarized which deal with visual information processing. They involve not whole model development but a family of subroutines customized to add the human aspects to existing models. A global diagram of the generalized model development/validation process is presented and related to 15 criteria for model evaluation. Author

N79-33840*# Analytics, Inc., Willow Grove, Pa.
VISUAL PERFORMANCE MODELING IN THE HUMAN OPERATOR SIMULATOR
Melvin I. Strieb *In* NASA. Langley Res. Center Models of Human Operators in Vision Dependent Tasks Oct. 1979 p 19-31 refs (For primary document see N79-33838 24-53)
Avail: NTIS HC A05/MF A01 CSCL 05H

A brief description of the history of the development of the human operator simulator (HOS) model is presented. Features of the HOS micromodels that impact on the obtainment of visual performance data are discussed along with preliminary details on a HOS pilot model designed to predict the results of visual performance workload data obtained through oculometer studies on pilots in real and simulated approaches and landings. Author

N79-33841*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A BRIEF OVERVIEW OF THE THEORY AND APPLICATION OF THE OPTIMAL CONTROL MODEL OF THE HUMAN OPERATOR
Sheldon Baron *In* NASA. Langley Res. Center Models of Human Operators in Vision Dependent Tasks Oct. 1979 p 33-47 refs (For primary document see N79-33838 24-53)
Avail: NTIS HC A05/MF A01 CSCL 05H

The underlying motivation and concepts are presented, along with a review of the development and application of the model. The structure of the model is described and results validating the model are presented. R.E.S.

N79-33842*# AiResearch Mfg. Co., Phoenix, Ariz.
SAINT: A COMBINED SIMULATION LANGUAGE FOR MODELING MAN-MACHINE SYSTEMS
Deborah J. Seifert *In* NASA. Langley Res. Center Models of Human Operators in Vision Dependent Tasks Oct. 1979 p 49-60 refs (For primary document see N79-33838 24-53)
Avail: NTIS HC A05/MF A01 CSCL 05H

SAINT (Systems Analysis of Integrated Networks of Tasks) is a network modeling and simulation technique for design and analysis of complex man machine systems. SAINT provides the conceptual framework for representing systems that consist of discrete task elements, continuous state variables, and interactions between them. It also provides a mechanism for combining human performance models and dynamic system behaviors in a single modeling structure. The SAINT technique is described and applications of the SAINT are discussed. R.E.S.

N79-33843*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF VISUAL ESTIMATION OF SYSTEM STATE FROM ARBITRARY DISPLAYS
Patrick A. Gainer *In its* Models of Human Operators in Vision Dependent Tasks Oct. 1979 p 61-82 refs (For primary document see N79-33838 24-53)
Avail: NTIS HC A05/MF A01 CSCL 05H

A method is presented for implementing the state estimator of the manual control model when the system output is a visual display of arbitrary form; that is, the display may be pictorial, including real world, or made up of dials and pointers. The method is used to provide error criteria for a look-point controller that appears to be capable of modeling human scanning behavior. This model, if combined with a model of the control process, should be useful in predicting effects of changes in displays on performance of flight tasks. Author

N79-33844# Air Force Human Resources Lab., Brooks AFB, Tex. Flying Training Div.
UNDERGRADUATE PILOT TRAINING: VISUAL DISCRIMINATION PRETRAINING FOR LAND TASK Final Report, Jul. 1976 - Jun. 1978
Bernell J. Edwards, Douglas Weyer, and Bruce A. Smith AFSC Feb. 1979 40 p refs
(AF Proj. 1123)
(AD-A068141; AFHRL-TR-78-78) Avail: NTIS HC A03/MF A01 CSCL 05/9

The utility of training task-relevant visual discrimination stalls as prerequisite behaviors for subsequently taught landing skills was investigated in this study. A multi-media training package was developed and used to impart visual skills to student pilots prior to their training on the flightline in landing procedures in the T-37 aircraft. The transfer of the visual discrimination skills of the landing field environment was assessed by measuring students: landing skills in the Advanced Simulator for Pilot Training and in the T-37 aircraft. Results showed that pretrained and non-pretrained student group performances on most measures were not significantly different. In several specific parameters of performance, non-pretrained groups performed significantly better in the aircraft transfer tests as rated by instructor pilots. GRA

N79-33845# Kentucky Univ., Lexington. Wenner-Gren Research Lab.
THE CAUSES OF DECREMENTS IN AIRCREW PERFORMANCE PHYSIOLOGICAL CHANGES PRODUCED BY VIBRATION AND OTHER ENVIRONMENTAL STRESSES

AND RESPONSE OF THE CARDIOVASCULAR SYSTEM TO VIBRATION AND COMBINED STRESS Final Report, 1973 - 1978
Charles F. Knapp, J. M. Evans, and D. R. Randall 20 Sep. 1978 148 p refs
(Contract F44620-74-C-0012; AF Proj. 2312)
(AD-A069952; AFOSR-79-0676TR) Avail: NTIS HC A07/MF A01 CSCL 06/5

The goal of this program is the understanding of cardiovascular responses to whole body, low frequency, sinusoidal acceleration loading of the intact physiological system. Our efforts in the early phase of the program were limited to investigating cardiovascular responses to high frequency whole body acceleration (2-30Hz), but more recently have been extended to the domain between sustained and time-varying acceleration of less than 1 Hz. Results from the early phase indicated that whole-body acceleration in the 2-3Hz range produced an exercise-type response that was directly dependent on the force level applied. Mean heart rate, stroke volume, cardiac output and whole body oxygen consumption were found to be linearly dependent on the peak net force delivered to each animal. Results from the later phase of this study indicated that whole body acceleration in the .005 to 0.25 Hz range included a resonance-type phenomenon in which the neural regulatory systems appeared to be unable to regulate arterial pressure in the middle portion of this frequency range. GRA

N79-33846# Canyon Research Group, Inc., Westlake Village, Calif.
DEVELOPMENT OF AN OBJECTIVE GRADING SYSTEM ALONG WITH PROCEDURES AND AIDS FOR ITS EFFECTIVE IMPLEMENTATION IN FLIGHT Research Note, 15 Nov. 1977 - 14 Nov. 1978
Jerry M. Childs May 1979 49 p refs
(Contract DAHC19-77-C-0008; DA Proj. 2Q7-63743-A-772)
(AD-A071106; FTR-09-79; ARI-RN-79-18) Avail: NTIS HC A03/MF A01 CSCL 05/9

This report contains a description of the characteristics and tests of two alternative inflight scoring procedures. These procedures were designed to meet the requirements of (1) minimal data collection, and (2) objective scores for Initial Entry Rotary Wing (IERW) student performance on Basic Instrument maneuvers. The procedures were criterion-referenced, employing different performance criteria, sampling techniques, and scoring algorithms. They were subjected to tests in the UH-1 simulator to assess the potential value of various characteristics within each procedure for meeting the requirements. Results of the tests provided general indications of those characteristics which best discriminated proficiency within and among students across training days. GRA

N79-33847# National Technical Information Service, Springfield, Va.
HUMAN MEMORY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - May 1979
Mary E. Young Jul. 1979 307 p Supersedes NTIS/PS-78/0348, NTIS/PS-77/0352, NTIS/PS-76/0352, and NTIS/PS-75/297 (NTIS/PS-79/0640/7; NTIS/PS-78/0348; NTIS/PS-77/0352; NTIS/PS-76/0352; NTIS/PS-75/297) Avail: NTIS HC $28.00/MF $28.00 CSCL 05J

Reports on the abilities and functions of human memory and recall are cited. Reports on memory and learning methods are included; such as semantics, mnemonics, and visual and acoustic aids. (This updated bibliography contains 301 abstracts, 36 of which are new entries to the previous edition.) GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N79-33848*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
A SYSTEM FOR STERILIZING OBJECTS Patent Application
Coleman J. Bryan, Edward E. Wright, and Clyde V. Moyers, inventors (to NASA) Filed 8 Jun. 1979 12 p
(NASA-Case-KSC-11085-1; US-Patent-Appl-SN-046739) Avail: NTIS HC A02/MF A01 CSCL 06K

A system for producing a stream of humidified sterilizing gas for sterilizing objects such as the water systems in space vehicles is described. The system includes a source of sterilant gas which is fed to a mixing chamber having inlet and outlet ports. Water is carried in the mixing chamber, with the level of the water only partially filling the mixing chamber, to provide an empty space adjacent the top of the chamber. A heater is provided for heating the water in the chamber producing a humidified atmosphere. The sterilant gas is fed through an arcuate shaped tubular member connected to the inlet port of the mixing chamber to produce a vortex type of flow in the sterilant gas being humidified. A tubular member extends from the mixing chamber to supply the humidified sterilant gas to the object to be sterilized. Scrubbers are provided for removing the sterilant gas after use. NASA

N79-33849*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
SPACELAB SCRUBBER ANALYSIS AND TEST SUPPORT Final Report
30 Sep. 1979 38 p
(Contract NAS8-32628)
(NASA-CR-161309; LMSC/D678552) Avail: NTIS HC A03/MF A01 CSCL 06K

Contaminants to be used in qualification and development tests of the add-on charcoal bed scrubber were established, along with rates and methods for their introduction. The contaminant levels to be achieved were predicted and test results were analyzed. K.L.

N79-33850# Pacer Systems, Inc., Arlington, Va.
WORKLOAD AND THE CERTIFICATION OF HELICOPTERS FOR IFR OPERATION Final Report, Jul. 1978 - Jun. 1979
A. G. DeLucien, D. L. Green, S. W. Jordan, and J. J. Traybar Jun. 1979 127 p refs
(Contract DOT-FA77WA-3966)
(AD-A072758; FAA-RD-79-64; PAR-508-78-3) Avail: NTIS HC A07/MF A01 CSCL 01/3

A review of publications pertaining to workload definitions and evaluation, applicable to instrument flight rules (IFR) helicopter operations was accomplished. The role of aircrew workload in the IFR certification process was identified and a rationale was developed to allow determination of that portion of a pilot's attention and effort available for aircraft control. Performance objectives for required maneuvers were delineated and the interdependence of performance and workload was identified. Workload/performance implications for single and dual pilot IFR operations are reviewed. A series of flight maneuver patterns for use as IFR certification assessment tools was developed. A flying qualities workload evaluation scheme is offered for use in the FAA certification process for IFR approval of helicopters. R.E.S.

N79-33851*# San Jose State Univ. Foundation, Calif.
THE ROLE OF COGNITIVE SWITCHING IN HEAD-UP DISPLAYS
Edith Fischer May 1979 49 p refs
(Grant NsG-2269)
(NASA-CR-3137; A-7776; HUD-5) Avail: NTIS HC A03/MF A01 CSCL 01D

The pilot's ability to accurately extract information from either one or both of two superimposed sources of information was determined. Static, aerial, color 35 mm slides of external runway environments and slides of corresponding static head-up display (HUD) symbology were used as the sources. A three channel tachistoscope was utilized to show either the HUD alone, the scene alone, or the two slides superimposed. Cognitive performance of the pilots was assessed by determining the percentage of correct answers given to two HUD related questions, two scene related questions, or one HUD and one scene related question. A.W.H.

N79-33852# Army Research Inst. of Environmental Medicine, Natick, Mass.
OPTIMAL METHODS FOR PHYSIOLOGIC RESEARCH ON CLOTHING
Ralph F. Goldman 19 Jun. 1978 8 p
(DA Proj. 3E7-62777-A-845)
(AD-A071855; USARIEM-M-32/78) Avail: NTIS HC A02/MF A01 CSCL 06/17

Comfort is a 'state of contented well being' which depends on the interaction between three factors: (a) the environment, (b) the clothing worn and (c) the body's response to them. Physical, physiological and psychological factors must all be involved in clothing designed for comfort in any environment. Failure to include all three elements in studies of such clothing has frequently led to an unacceptable product. GRA

N79-33853# Defence Research Establishment Suffield, Ralston (Alberta).
A GENERAL MODEL FOR THE TRANSFER OF VAPOUR THROUGH CLOTHED SKIN FROM LIQUID ON AND IN CLOTHING
Stanley B. Mellsen Jun. 1979 58 p refs
(AD-A071577; DRES-TP-495) Avail: NTIS HC A04/MF A01 CSCL 12/1

A mathematical model which was developed by Monaghan at DRES was extended to predict the penetration of vapor through clothed skin for an initial liquid load on or in the clothing. The model and its associated computer program along with some sample calculations are described in this report. GRA

N79-33801# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF THE VIBRATION COMPONENT TO THE DELETERIOUS EFFECT OF IMPACT ACCELERATIONS
G. P. Mirolyubov, V. A. Elivanov, and G. P. Stupakov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 71-76 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 51-54 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33807# Joint Publications Research Service, Arlington, Va.
QUALITY OF WATER RECLAIMED FROM URINE AS RELATED TO pH OF INITIAL PRODUCT
N. M. Nazarov, I. V. Yakimova, N. A. Golikova, Yu. Ye. Sinyak, and S. V. Chizhov *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 105-108 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 73-76 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

N79-33808# Joint Publications Research Service, Arlington, Va.
EVALUATION OF OXIDIZABILITY OF AIR IN CLOSED AREAS
L. A. Mokhov, L. D. Karpova, and N. Ya. Shuinova *In its* Space Biol. and Aerospace Med., No. 4, 1979 (JPRS-74330) 9 Oct. 1979 p 109-112 refs Transl. into ENGLISH from Kosm. Biol. i Aviakosm. Med. (Moscow), no. 4, 1979 p 76-78 (For primary document see N79-33789 24-51)
Copyright. Avail: NTIS HC A07/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N79-33854*# National Aeronautics and Space Administration, Washington, D. C.
PUBLICATIONS OF THE PLANETARY BIOLOGY PROGRAM FOR 1978: A SPECIAL BIBLIOGRAPHY
Linda G. Pleasant, comp. and Richard S. Young, comp. Oct. 1979 38 p
(NASA-TM-80745) Avail: NTIS HC A03/MF A01 CSCL 06C

The planetary events which are responsible for, or related to, the origin, evolution, and distribution of life in the universe are investigated. Bibliographies from chemical evolution, organic geochemistry, life detection, biological adaptation, bioinstrumentation, planetary environments, and origin of life studies are presented. A.W.H.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

N79-33855*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMPUTER-AUTOMATED OPPONENT FOR MANNED AIR-TO-AIR COMBAT SIMULATIONS
Walter W. Hankins, III Sep. 1979 153 p refs
(NASA-TP-1518; L-12768) Avail: NTIS HC A08/MF A01 CSCL 12B

Two versions of a real-time digital-computer program that operates a fighter airplane interactively against a human pilot in simulated air combat were evaluated. They function by replacing one of two pilots in the Langley differential maneuvering simulator. Both versions make maneuvering decisions from identical information and logic; they differ essentially in the aerodynamic models that they control. One is very complete, but the other is much simpler, primarily characterizing the airplane's performance (lift, drag, and thrust). Both models competed extremely well against highly trained U.S. fighter pilots. Author

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N79-33856 Rice Univ., Houston, Tex.
THE STRUCTURED DESIGN OF A SOFTWARE DIRECTED ARCHITECTURE Ph.D. Thesis
Anand Jagannathan 1979 360 p
Avail: Univ. Microfilms Order No. 7919596

A model of a computer architecture in which the design is strongly influenced by software considerations is presented. Such an architecture is called software directed. In the proposed architecture, there are two ways in which software influences the design. First, the architecture supports the design methodology of data abstraction. This methodology is becoming increasingly prevalent in software design. Second, the architecture is modeled such that any software subsystem can be implemented as part of the architecture. This is called incorporating the subsystems within the architecture. A distinction is made between the implementation of a subsystem as software and its implementation as part of the architecture. A set of features for the use of abstraction in a programming language is described. Dissert. Abstr.

N79-33857# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
IMPLEMENTATION ON THE FM-1600B COMPUTER OF A BASIC INTERPRETATOR [IMPLEMENTACAO NO COMPUTADOR FM-1600B DE UM INTERPRETADOR BASIC]
Aurelio Gomes Ferreira Jul. 1979 280 p In PORTUGUESE; ENGLISH summary Revised
(INPE-1528-TDL/012) Avail: NTIS HC A13/MF A01

The project and implementation of an Iterative BASIC Interpretator designed for the processing of small and simple programs on FERRANTI FM 1600 B computer are described. The system consists of a syntax analyser, an intermediate form generator, an editor and an executor. M.M.M.

N79-33858*# National Aeronautics and Space Administration. Earth Resources Labs., Bay St. Louis, Miss.

PROCEDURE FOR EXTRACTION OF DISPARATE DATA FROM MAPS INTO COMPUTERIZED DATA BASES

Bobby G. Junkin Washington Oct. 1979 23 p refs

(NASA-RP-1048) Avail: NTIS HC A02/MF A01 CSCL 09B

A procedure is presented for extracting disparate sources of data from geographic maps and for the conversion of these data into a suitable format for processing on a computer-oriented information system. Several graphic digitizing considerations are included and related to the NASA Earth Resources Laboratory's Digitizer System. Current operating procedures for the Digitizer System are given in a simplified and logical manner. The report serves as a guide to those organizations interested in converting map-based data by using a comparable map digitizing system.

Author

N79-33859# General Electric Co., Pittsfield, Mass. Ordnance Systems.

CHARACTERIZATION OF MICROPROCESSORS AND MICROPROCESSOR SUPPORT CHIPS Final Technical Report, Jan. - Sep. 1978

Thomas M. Ostrowski Jun. 1979 94 p

(Contract F30602-77-C-0012; AF Proj. 2338)

(AD-A071926; RADC-TR-79-130) Avail: NTIS HC A05/MF A01 CSCL 09/1

The objective of this effort was to develop high test confidence level functional tests and parametric tests for selected microprocessors and microprocessor support devices; and then generate MIL-M-38510 slash sheets for them which conformed to military standards. This included worst case test situations, critical timing and generation of new test procedures where present or accepted methods no longer apply. Devices characterized were the 1802 CMOS microprocessor, 8228/38 system controller and bus driver, 8224 clock generator and driver and 6821 peripheral interface adapter. GRA

N79-33860# Federal COBOL Compiler Testing Service, Washington, D. C.

COBOL COMPILER VALIDATION SUMMARY REPORT. CONTROL DATA CORPORATION NOS OPERATING SYSTEM

19 Jun. 1979 94 p

(AD-A071143; FCCTS/CCVS74-VSR395) Avail: NTIS HC A05/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the CDC NOS COBOL Compiler Version 5.2/485 (NOS Version 1.3/485) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the HIGH level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N79-33861# SRI International Corp., Menlo Park, Calif. Computer Science Lab.

FORMAL TECHNIQUES FOR FAULT-TOLERANCE IN DISTRIBUTED DATA PROCESSING (DDP) Final Report

Jack Goldberg, William Kautz, Leslie Lamport, and Peter Neumann 3 Apr. 1979 72 p refs

(Contract DASG60-78-C-0046)

(AD-A071030) Avail: NTIS HC A04/MF A01 CSCL 09/2

Distributed data processing can lead to systems with greatly improved reliability when compared with conventional systems, and can offer flexible strategies for redundancy, self-testing, and reconfiguration. DDP systems also have potential advantages in security, efficiency, and evolvability. The work in this contract is aimed at providing a suitable theoretical basis for the development of practical techniques for DDP system design and verification. Three fundamental issues have been investigated and are reported here: hierarchical structure in DDP systems; achievement of consistent redundant data representations in faulty networks--specification, design, and validation; and self-diagnosability in DDP networks. GRA

N79-33862# Motorola, Inc., Scottsdale, Ariz. Government Electronics Div.

VIDEO MEMORY MODULES Final Report, 1 Sep. 1977 - 15 May 1978

Larry A. Hopper Feb. 1979 114 p refs

(Contract F33615-77-C-1142; AF Proj. 6096)

(AD-A070944; AFAL-TR-79-1003) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report summarizes the results of the exploratory development of a video frame store memory which can (a) lower the sensor frame rate to provide increased A/J protection, and (b) refresh a TV monitor at the normal rate while operating at reduced frame rates. Also, a similar unit for second-generation FLIR systems was investigated to (a) freeze the display momentarily to give an observer additional time to search for details, and (b) to improve system sensitivity for the detection of fixed or slowly moving objects by integrating successive frames of video as the image is displayed. This effort is being conducted in parallel with investigations at AFAL to develop a low-cost A/J video data link for advanced RPV's and guided missiles. This exploratory development was divided into two phases. The first phase was devoted to circuit design and module definition. The second phase involved the brassboard fabrication and testing of two prototype video memories for RPV bandwidth reduction systems employing 64K digital CCD memories for the primary frame store function. The primary goal was to realize the imaging system at a minimum of memory cost, size, weight and power dissipation through the use of a common modular packaging approach. GRA

N79-33863# Science Applications, Inc., Englewood, Colo.

HUMAN FACTORS IN COMPUTER SYSTEMS: REVIEW OF THE LITERATURE AND DEVELOPMENT OF DESIGN AIDS Final Report, 1 Jun. 1976 - 13 Jul. 1979

H. Rudy Ramsey 31 Jul. 1979 12 p refs

(Contract N00014-76-C-0866)

(AD-A071597; SAI-79-113-DEN) Avail: NTIS HC A02/MF A01 CSCL 05/5

This is the final report of Contract N00014-76-C-0866, covering a broad descriptive and critical survey of the literature on human factors in computer systems. The basic purpose of this effort was to assess the current state of the art in this area in order to evaluate the feasibility of developing a human factors guide to computer system design. Two technical reports were issued under this contract. The first is a critically annotated and heavily indexed bibliography of 564 reports selected from the surveyed literature. The second is a critical overview of the state of the art, with recommendations for a design guide. The basic conclusion of this study is that a human factors design guide for interactive systems -- which discusses issues, alternatives, and methods in the context of the design process -- is both feasible and needed. The current state of the art was not found adequate to support the development of a quantitative reference handbook in this area. GRA

N79-33864# Strategic Air Command, Offutt AFB, Nebr.

THE INTERFACE OF COBOL AND FORTRAN ON THE HONEYWELL 6080 AND IBM 370/3033 COMPUTER SYSTEMS Final Report

D. W. Lind, Roger D. Geer, James W. White, and Donald P. McCanless 1 Apr. 1979 218 p refs

(AD-A070959) Avail: NTIS HC A10/MF A01 CSCL 09/2

This report describes the research performed in the interface of the COBOL and FORTRAN programming languages on the IBM 370/3033 and the Honeywell 6080 computers. It identifies specific problem areas in the linkage of the two languages and the transference of programs between machines. The report also includes solutions and alternatives to most difficulties encountered and recommendations for successful language interface and program transfer from one computer to the other. GRA

N79-33865# National Technical Information Service, Springfield, Va.

MICROCOMPUTERS, PART 3. BASIC DESIGN AND DEVELOPMENT, VOLUME 5. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Jun. 1978 - 1979

Brian Carrigan Jul. 1979 217 p Supersedes NTIS/PS-78/0615;

NTIS/PS-77/0329; NTIS/PS-76/0204
(NTIS/PS-79/0730/6; NTIS/PS-78/0615; NTIS/PS-77/0329; NTIS/PS-76/0204) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The bibliography to worldwide research literature cites studies on the design and development of microcomputers. Studies on software development, chip development, LSI technology, and reliability and performance evaluation testing are included. GRA

N79-33866# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS. PART 3: BASIC DESIGN AND DEVELOPMENT, VOLUME 4. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Apr. 1977 - May 1978
Brian Carrigan Jul. 1979 269 p
(NTIS/PS-79/0729/8) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The bibliography of worldwide research literature cites studies on the design and development of microcomputers. Studies on software development, chip development, LSI technology, and reliability and performance evaluation testing are included. (This updated bibliography contains 263 abstracts, none of which are new entries to the previous edition.) GRA

N79-33867# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS: GENERAL APPLICATIONS, VOLUME 1. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - 1977
Brian Carrigan Jul. 1979 183 p
(NTIS/PS-79/0724/9) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

Research articles citing studies on the applications of minicomputers are reported. These include process control, testing, navigation, instrumentation, biomedicine, machining, training, as well as other applications. Two hundred and sixteen abstracts are included. GRA

N79-33868# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS: GENERAL APPLICATIONS, VOLUME 2. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1978 - May 1979
Brian Carrigan Jul. 1979 190 p Supersedes NTIS/PS-78/0609
(NTIS/PS-79/0725/6; NTIS/PS-78/0609) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

This bibliography of Federally-funded research cites studies on the applications of minicomputers. These include process control, testing, navigation, instrumentation, biomedicine, machining, training, as well as other applications. This updated bibliography contains 181 abstracts, 139 of which are new entries to the previous edition. GRA

N79-33869# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS: DESIGN AND SOFTWARE DEVELOPMENT. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - May 1979
Brian Carrigan Jul. 1979 243 p Supersedes NTIS/PS-78/0610
(NTIS/PS-79/0723/1; NTIS/PS-78/0610) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The design of microcomputers and the development of its software are covered in this bibliography of Federally-funded research. Studies on microcomputer applications are included only if the above topics are cited. Circuit and chip technology, reliability, and performance evaluation are included. This updated bibliography contains 234 abstracts, 38 of which are new entries to the previous edition. GRA

N79-33870# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS. PART 2: TELECOMMUNICATION APPLICATIONS, VOLUME 3. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, Mar. 1976 - Jun. 1979
William E. Reed Jul. 1979 266 p Supersedes NTIS/PS-78/0613; NTIS/PS-77/0328; NTIS/PS-76/0203
(NTIS/PS-79/0728/0; NTIS/PS-78/0613; NTIS/PS-77/0328; NTIS/PS-76/0203) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

The bibliography of worldwide research literature cites studies on telecommunication applications of microcomputers. telephone, data transmission, teleprinters, facsmile communications, and communications controllers are among the applications cited. GRA

N79-33871# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS. PART 1: GENERAL APPLICATIONS, VOLUME 5. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1978 - May 1979
Brian Carrigan Jul. 1979 103 p Supersedes NTIS/PS-78/0612; NTIS/PS-77/0327; NTIS/PS-76/0204
(NTIS/PS-79/0727/2; NTIS/PS-78/0612; NTIS/PS-77/0327; NTIS/PS-76/0204) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

Research on the applications of microcomputers is presented. These include automotive, testing, navigation instrumentation, biomedical, machine tools, and other applications. (This updated bibliography contains 97 abstracts, 30 of which are new entries to the previous edition). GRA

N79-33872# National Technical Information Service, Springfield, Va.
MICROCOMPUTERS, PART 4. INDUSTRIAL PROCESS CONTROL APPLICATIONS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jul. 1979
Guy E. Habercom, Jr. Jul. 1979 290 p Supersedes NTIS/PS-78/0616
(NTIS/PS-79/0731/4; NTIS/PS-78/0616) Avail: NTIS HC $28.00/MF $28.00 CSCL 09B

Industrial applications of microcomputers to expedite processes are investigated in these reports gathered in a worldwide literature survey. Such diversified industries as pulp mills, rubber processing industry, chemical plants, metal fabrication plants, and machine shops are researched to ascertain the effectiveness of microcomputers as a process control tool. Comparative analyses of microcomputers and their control systems are made. Two hundred and eighty four abstracts are included. GRA

N79-33873# National Bureau of Standards, Washington, D. C. Application Systems Div.
COMPUTER SCIENCE AND TECHNOLOGY: DATA BASE REORGANIZATION: PRINCIPLES AND PRACTICE Final Report
Gary H. Sockut and Robert P. Goldberg (BGS Systems, Inc., Lincoln, Mass.) Apr. 1979 57 p refs
(PB-295425/3; NBS-SP-500-47; LC-79-600055) Avail: NTIS HC A04/MF A01 CSCL 09B

The basic concepts of data base reorganization, including why it is performed are introduced. Examples of types of reorganization are described and classified into logical/physical levels. Pragmatic issues such as reorganization strategy, commercial reorganization facilities, case studies, and data base administration considerations are covered. Several research efforts are surveyed. GRA

N79-33874# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY MEASUREMENT OF INTERACTIVE COMPUTING: METHODOLOGY AND APPLICATION
Ira W. Cotton Jun. 1979 114 p refs
(PB-297201/6) Avail: NTIS HC A06/MF A01 CSCL 09B

The measurement of interactive computing, including both the computer system providing service and the users demanding and receiving it, is presented. The focus is on the performance of the user and the system in individual interaction sessions (rather than on the performance of the system under varying conditions of load). A measurement tool developed at the National Bureau of Standards is employed to record a large number of individual interactive sessions over a period of three years. The

basic data of interest are the number and rate of characters sent by user and system, and latencies or delays prior to and during transmission by either party. GRA

N79-33875# National Bureau of Standards, Washington, D. C. Center for Programming Science and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: MODELING AND MEASUREMENT TECHNIQUES FOR EVALUATION OF DESIGN ALTERNATIVES IN THE IMPLEMENTATION OF DATABASE MANAGEMENT SOFTWARE Final Report
Donald R. Deutsch Jul. 1979 249 p refs
(PB-297846/8; NBS-SP-500-49; LC-79-600088) Avail: NTIS HC A11/MF A01 CSCL 09B

It is demonstrated that proposed DBMS designs can be evaluated through the use of performance prediction models based on prototype implementations and associated measurement systems. A set theoretic implementation of a DBMS with a relational user in interface as an object is used. GRA

N79-33876# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: RECOMMENDATIONS FOR DATABASE MANAGEMENT SYSTEM STANDARDS Final Report, Special Publication
Aug. 1979 103 p refs
(PB-297848/4; NBS-SP-500-51; LC-79-600087) Avail: NTIS HC A06/MF A01 CSCL 09B

The need for data base standards within the Federal government was studied. Alternatives to Federal standards and actions of other standards bodies were considered along with the issues of standards adoption, timing, and impact on technology. Recommendations for standards and guidelines as well as the assumptions, benefits, and costs considerations used to justify the recommendations are presented. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N79-33877 Ohio State Univ., Columbus.
TRANSLATIONS BETWEEN PROGRAMMING LANGUAGES Ph.D. Thesis
Frederick Joseph Dickey 1979 271 p
Avail: Univ. Microfilms Order No. 7922475

A simple scheme for constructing translators between higher level programming languages is investigated. This scheme basically consists of translating statements into like statements, for example, assignment statements of one language into assignment statements of another language. Although this approach is clearly not adequate for constructing arbitrary translators, it is probably adequate for constructing translators between similar languages. This approach is tested by defining two simple but not completely trivial programming languages and by attempting to construct a translator between these languages.
Dissert. Abstr.

N79-33878 Northeastern Univ., Boston, Mass.
COMPUTER GENERATION OF NON-ISOMORPHIC COMPLETE DIRECTED GRAPHS Ph.D. Thesis
Carroll Frances McMahon 1979 229 p
Avail: Univ. Microfilms Order No. 7923538

The problem of constructing the list of all nonisomorphic tournaments for a given n vertices is addressed. The list of strings of 0's and 1's representing all labeled tournaments is generated. The concept of a path counting matrix of size (n+1) by n is then introduced. Two tournaments with different path counting matrices must be nonisomorphic; however, occasionally two nonisomorphic labeled tournaments have the same path counting matrices. The representation (Labeled tournaments)-(Path counting matrices) is many-to-one. The term quasimorphism is introduced for such a near representation. Path counting matrices are calculated from the (0,1) representation of the labeled tournaments. Then, starting with each path counting matrix and using a backtracking algorithm (written in PASCAL) all the possible nonisomorphic tournaments which it represents are determined. A plotting routine draws a picture of each nonisomorphic tournament using the standard pictorial representation scheme. Quasimorphism feedback helps determine how good a representation a quasimorphism must be. This represents a pragmatic approach to computer algorithms, where an intractable problem is solved by a method whose exact form varies with the values of the parameter involved. Dissert. Abstr.

N79-33879 Duke Univ., Durham, N. C.
SEMANTIC AND PROCEDURAL PROCESSING FOR A NATURAL LANGUAGE PROGRAMMING SYSTEM Ph.D. Thesis
Bruce Wilson Ballard 1979 207 p
Avail: Univ. Microfilms Order No. 7922734

Details of syntactic and semantic processing are discussed. Special attention is devoted to general matters such as conjunction, resolution of ambiguity, pronouns and other words requiring pronominal processing, and programming features such as 'if', 'repeat', and procedure definition. It is shown that a large percentage of the mechanisms are essentially domain independent. The natural language computer (NLC) makes possible the testing of theories of language understanding. For example, each of several mechanisms for pronoun resolution are tested without having to alter other parts of the system. The NLC environment also permits observation of experts expressing themselves in the absence of the constraints of most high level languages. This information is useful for making conventional programming languages more natural. Dissert. Abstr.

N79-33880 Colorado Univ. at Boulder.
MACHINE-INDEPENDENT REAL-TIME OPERATING SYSTEM INTERFACES Ph.D. Thesis
Bruce Kenneth Haddon 1979 229 p
Avail: Univ. Microfilms Order No. 7923245

The application of abstract machine modeling to the implementation of higher-level languages intended for real time programming, with the intent of achieving machine-independence and thereby a useful degree of portability for those components of all programs that involve some real time elements. The abstract machine model for real time activities is conceived as a definition of an interface between the machine-independent representation of the higher-level program and the set of possible target machine operating systems. Attention is concentrated upon modeling the requirements for concurrency and tasking control in so-called real time languages, and the time dependent requirements generated by input/output operations in other higher-level languages. The model is proposed as an extension to the Janus universal intermediate language. The extensions include a task declaration, a task call, processor control operations, and additional modes for handling time values, semaphores, and interrupts.
Dissert. Abstr.

N79-33881*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
AN EXPANDED SYSTEM SIMULATION MODEL FOR SOLAR ENERGY STORAGE (TECHNICAL REPORT), VOLUME 1 Final Report
A. W. Warren Aug. 1979 107 p refs 2 Vol.
(Contracts DEN3-42; EX-76-A-31-1026)
(NASA-CR-159601; DOE/NASA/0042-79/1-Vol-1; BCS-40159-1) Avail: NTIS HC A06/MF A01 CSCL 09B

The simulation model for wind energy storage (SIMWEST) program now includes wind and/or photovoltaic systems utilizing any combination of five types of storage (pumped hydro, battery, thermal, flywheel and pneumatic) and is available for the UNIVAC 1100 series and the CDC 6000 series computers. The level of detail is consistent with a role of evaluating the economic feasibility as well as the general performance of wind and/or photovoltaic energy systems. The software package consists of two basic programs and a library of system, environmental, and load components. The first program is a precompiler which generates computer models (in FORTRAN) of complex wind and/or photovoltaic source/storage/application systems, from user specifications using the respective library components. The second program provides the techno-economic system analysis with the respective I/O, the integration of system dynamics, and the iteration for conveyance of variables. A.R.H.

N79-33882*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
AN EXPANDED SYSTEM SIMULATION MODEL FOR SOLAR ENERGY STORAGE (UNIVAC OPERATION MANUAL REVISIONS), VOLUME 2 Final Report
A. W. Warren Aug. 1979 198 p refs 2 Vol.
(Contracts DEN3-42; EX-76-A-31-1026)
(NASA-CR-159602; DOE/NASA/0042-79/2-Vol-2; BCS-40180-2-Rev) Avail: NTIS HC A09/MF A01 CSCL 09B

Additions or revisions of components of the SIMWEST program are provided for insertion into the manual used with the UNIVAC 1100 series computer. A.R.H.

N79-33883*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
SIMWEST: A SIMULATION MODEL FOR WIND AND PHOTOVOLTAIC ENERGY STORAGE SYSTEMS (CDC USER'S MANUAL), VOLUME 1 Final Report
A. W. Warren and A. W. Esinger Aug. 1979 486 p refs 2 Vol.
(Contracts DEN3-42; EX-76-A-31-1026)
(NASA-CR-159607; DOE/NASA/0042-79/3-Vol-1; BCS-40262-1) Avail: NTIS HC A21/MF A01 CSCL 09B

Procedures are given for using the SIMWEST program on CDC 6000 series computers. This expanded software package includes wind and/or photovoltaic systems utilizing any combination of five types of storage (pumped hydro, battery, thermal, flywheel, and pneumatic). A.R.H.

N79-33884*# Boeing Computer Services, Inc., Seattle, Wash. Energy Technology Applications Div.
SIMWEST: A SIMULATION MODEL FOR WIND AND PHOTOVOLTAIC ENERGY STORAGE SYSTEMS (CDC PROGRAM DESCRIPTIONS), VOLUME 2 Final Report
A. W. Warren, R. W. Edsinger, and J. D. Burroughs Aug. 1979 247 p 2 Vol.
(Contracts DEN3-42; EX-76-A-31-1026)
(NASA-CR-159608; DOE/NASA/0042-79/4-Vol-2; BCS-40262-2) Avail: NTIS HC A11/MF A01 CSCL 09B

The computer programs for the CDC version of SIMWEST (1979 revision) are described. Macro flow charts and source code listings for each major program entity are presented.A.R.H.

N79-33885# Computer Sciences Corp., Silver Spring, Md. System Sciences Div.
CENTRAL FLOW CONTROL OPERATIONAL COMPLEX (OPCX): USER'S MANUAL Final Report
Jan. 1979 164 p
(Contract DOT-FA77WA-3955)
(AD-A069872; CSC/SD-78/6167; FAA-RD-79-34) Avail: NTIS HC A08/MF A01 CSCL 09/2

The central flow control messages and their related output reports are described. For each message, each input field is described and the range of valid input values is specified. Error diagnostic messages are listed. K.L.

N79-33886*# National Aeronautics and Space Administration, Washington, D. C.
APPLICATION OF ABSTRACT HARMONIC ANALYSIS TO THE HIGH-SPEED RECOGNITION OF IMAGES
D. A. Usikov Oct. 1979 14 p refs Transl. into ENGLISH of Primeniye Abstraktnogo Garmonicheskogo Analiza Dlya Bystrogo Raspozhavaniya Izobrazheniy (Moscow), report PR-335, 1977 p 1-12 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-75710) Avail: NTIS HC A02/MF A01 CSCL 09B

Methods are constructed for rapidly computing correlation functions using the theory of abstract harmonic analysis. The theory developed includes as a particular case the familiar Fourier transform method for a correlation function which makes it possible to find images which are independent of their translation in the plane. Two examples of the application of the general theory described are the search for images, independent of their rotation and scale, and the search for images which are independent of their translations and rotations in the plane. J.M.S.

N79-33887# Maryland Univ., College Park. Dept. of Computer Science.
TESTING DATA ABSTRACTIONS THROUGH THEIR IMPLEMENTATIONS Interim Report
Richard Hamlet, Mark Ardis, John Gannon, and Paul McMullin May 1979 41 p refs
(Grant AF-AFOSR-3181-77; AF Proj. 2304)
(AD-A070957; TR-761; AFOSR-79-0796TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

A data abstraction can be specified by a syntactic (domain-range) description of its objects and operations on them, plus a set of axioms describing the behavior of the operations. In a programming language that supports abstraction, abstract objects are given a representation in terms of built-in data types (or other, previously defined abstractions), and the abstract operations are defined as procedures. The implemented abstraction has a meaning, acquired from the definition of the programming language; the axioms also specify an independent meaning. The crucial question is then whether or not either meaning is 'correct', that is, whether it corresponds to the desired abstraction that the programmer has in mind. Using a finite collection of tests, the axiom meaning and the code meaning can be compared for consistency. A compiler-based system, DAISTS, is described for automating this process. GRA

N79-33888# General Research Corp., Santa Barbara, Calif. Systems Technologies Group.
AN EXPERIMENTAL EVALUATION OF SOFTWARE TESTING Final Report
C. Gannon, R. N. Meeson, and N. B. Brooks May 1979 107 p refs
(Contract F49620-78-C-0103; AF Proj. 2304)
(AD-A071050; GRC-CR-1-854; AFOSR-79-0733TR) Avail: NTIS HC A06/MF A01 CSCL 09/2

The techniques evaluated are path (branch) coverage testing and static analysis. The basic approach was to prepare programs for testing by seeding them with errors whose type and frequency are typical of new software at the integration- or system-level of testing. The experiments were conducted in three phases. The first used eight small programs from a popular programming manual, the second and third used a 5000-line FORTRAN program used to simulate ballistic-missile defense engagements. For the most part, both the path testing and static analysis used the SQLAB tool, with the techniques used singly and in combination. In Phase 1, the DAVE system's static analysis capabilities were also used. In Phase 3, the techniques were compared with the techniques of intermediate-value printout and control-flow tracing. The inescapable conclusion remains, however, that fully automated computer-aided testing is not possible at present. Further, the errors that are not detected are generally considered difficult to locate by conventional techniques. GRA

N79-33889# George Washington Univ., Washington, D. C. Inst. for Management Science and Engineering.
EXTENSIONS OF THE GAUVIN-TOLLE OPTIMAL VALVE DIFFERENTIAL STABILITY RESULTS TO GENERAL MATHEMATICAL PROBLEMS
Anthony V. Fiacco and William P. Hutzler 20 Apr. 1979 45 p refs
(Grant DAAG29-76-G-0150)
(AD-A071746; SERIAL-T-393; ARO-13622.7-M) Avail: NTIS HC A03/MF A01 CSCL 12/1

Gauvin and Tolle have obtained bounds on the directional derivative limit quotient of the optimal value function for mathematical programs containing a right-hand side perturbation. In this paper, we extend the results of Gauvin and Tolle to the general mathematical program in which a parameter appears arbitrarily in the constraints and in the objective function. An implicit function theorem is applied to transform the general mathematical program to a locally equivalent inequality constrained program, and, under conditions used by Gauvin and Tolle, their upper and lower bounds on the optimal value function directional derivative limit quotient are shown to pertain to this reduced program. These bounds are then shown to apply in

programs having both inequality and equality constraints where a parameter may appear anywhere in the program. GRA

N79-33890# Stanford Univ., Calif. Dept. of Computer Science.
RECURSIVE PROGRAMS AS FUNCTIONS IN A FIRST ORDER THEORY
Robert Cartwright and John McCarthy Mar. 1979 34 p refs
(Contract MDA903-76-C-0206; Grants NSF MCS-78-00524; NSF MCS-78-05850; ARPA Order 2494)
(AD-A071421; SU-STAN-CS-79-717; AIM-324) Avail: NTIS HC A03/MF A01 CSCL 09/2

Pure Lisp style recursive function programs are represented in a new way by sentences and schemata of first order logic. This permits easy and natural proofs of extensional properties of such programs by methods that generalize structural induction. It also systematizes known methods such as recursion induction, subgoal induction, inductive assertions by interpreting them as first order axiom schemata. We discuss the metatheorems justifying the representation and techniques for proving facts about specific programs. We also give simpler version of the Goedel-Kleene way of representing computable functions by first order sentences. GRA

N79-33891# Computer Sciences Corp., Silver Spring, Md. System Sciences Div.
CENTRAL FLOW CONTROL DATA REDUCTION AND ANALYSIS COMPONENT USER'S MANUAL Final Report
Jan. 1979 91 p
(Contract DOT-FA77WA-3955)
(AD-A069893; FAA-RD-79-40; CSC/SD-78/6153) Avail: NTIS HC A05/MF A01 CSCL 09/2

The functions of the data reduction and analysis (RA) programs and the procedures required to exercise them are described. The RA is comprised of four off-line analysis programs: (1) the archive log queue (ALQ) tape filter program; (2) the ALQ filtered data report generator program; (3) the system analysis recording dump program; and (4) the data base analysis program. The programs enable evaluation of system performance and system load characteristics, and provide important aids for analysis. K.L.

N79-33892# Stanford Univ., Calif. Dept. of Computer Science.
STANFORD PASCAL VERIFIER USER MANUAL
D. C. Luckham, S. M. German, F. W. V. Henke, R. A. Karp, and P. W. Milne Mar. 1979 120 p refs
(Contract MDA903-76-C-0206; ARPA Order 2494)
(AD-A071900; SU-STAN-CS-79-731; SVG-11) Avail: NTIS HC A06/MF A01 CSCL 05/2

The Stanford Pascal verifier is an interactive program verification system. It automates much of the work necessary to analyze a program for consistency with its documentation, and to give a rigorous mathematical proof of such consistency or to pin-point areas of inconsistency. It has been shown to have applications as an aid to programming, and to have potential for development as a new and useful tool in the production of reliable software. GRA

N79-33893# Texas Univ. at Arlington. Dept. of Computer Science.
IMPLEMENTATION AND EVALUATION OF INERTIAL ARITHMETIC SOFTWARE. REPORT 4: THE IBM 370, DEC 10, AND DEC PDP-11/70 SYSTEMS
Ronnie G. Ward Apr. 1979 75 p refs
(Contracts DACA39-76-M-0247; DACA39-76-M-0356)
(AD-A070530; WES-TR-0-79-1) Avail: NTIS HC A04/MF A01 CSCL 09/2

Using interval arithmetic as prescribed in the Interval II package is simple because of the AUGMENT preprocessor. Computer runs illustrate that interval arithmetic can show the instability of an algorithm for a given set of data. On the other hand, interval arithmetic can establish a high level of confidence in an algorithm for a given set of data. Interval arithmetic should be used (as any tool would be) where accuracy is of critical importance. Interval arithmetic is expensive to use in terms of computer time, main storage, and personnel time spent in error analysis. Some reasonable means of estimating the cost of using interval arithmetic in a given situation should be developed. These costs would be important in the decision process of determining whether or not interval arithmetic would be worth the effort or not. Techniques of accuracy extension on short word length machines should be examined. GRA

N79-33894# Puk (Richard F.), Albuquerque, N. Mex.
DEVICE IMPLEMENTATION GUIDELINES FOR THE THREE-DIMENSIONAL GRAPHICS COMPATIBILITY SYSTEM (GCS) Final Report
Richard F. Puk Mar. 1979 53 p
(Contract DACA39-78-M-0053)
(AD-A070867; WES-MP-0-79-2) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report develops guidelines for implementing new devices for the three-dimensional version of the Graphics Compatibility System (GCS). Included are the definition of device-dependent graphics, status area initialization values, functional specification of device-dependent routines, factors involved in supporting intelligent refresh devices, and a phased sequence for implementing new devices. GRA

N79-33895# Massachusetts Inst. of Tech., Cambridge. Computer Science Lab.
THE MDL PROGRAMMING LANGUAGE
Stuart W. Galley and Greg Pfister Jun. 1979 280 p
(Contract N00014-75-C-0661)
(AD-A070930) Avail: NTIS HC A13/MF A01 CSCL 09/2

The MDL programming language began existence in late 1970 (under the name Muddle) as a successor to Lisp (Moon, 1974), a candidate vehicle for the Dynamic Modeling System, and a possible base for implementation of Planner (Hewitt, 1969). The original design goals included and interactive integrated environment for programming, debugging, loading, and editing; ease in learning and use: facilities for structured, modular, shared programs; extensibility of syntax, data types and operators; data-type checking for debugging and optional data-type declarations for compiled efficiency: associative storage, coroutining, and graphics. GRA

N79-33896# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
SET OF SAMPLE PROBLEMS FOR DOD HIGH ORDER LANGUAGE PROGRAM. GREEN SOLUTIONS
Apr. 1979 75 p Prepared in cooperation with CII Honeywell Bull, Louveciennes, France
(Contract MDA903-77-C-0331)
(AD-A070752) Avail: NTIS HC A04/MF A01 CSCL 09/2

Contents: Polled Asynchronous Interrupt; Priority Interrupt System; A Small File Handling Package; Dynamic Pictures; A Database Protection Module; A Process Control Example; Adaptative Routing Algorithm for a Node within a Data Switching Network; General Purpose Real-Time Scheduler; Distributed Parallel Output; and Unpacking and Conversion of data. GRA

N79-33897# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
THE GREEN LANGUAGE: AN INFORMAL INTRODUCTION
Apr. 1979 103 p Prepared in cooperation with CII Honeywell Bull, Louveciennes, France
(Contract MDA903-77-C-0331)
(AD-A070753) Avail: NTIS HC A06/MF A01 CSCL 09/2

This document is an introduction to the Green programming language. Like any introduction, we emphasize the concepts that form the foundation of the language, rather than attempt to describe the entire language or to provide a self-contained guide for writing programs. Our objective is to convey the essence of the language, mainly through examples. We assume that the reader has experience in another higher order programming language. No other particular kind of expertise is assumed. This introduction is organized in three successive levels. Chapter 1 - This opening chapter provides a very brief sketch of the facilities that have an analogue in many other higher order languages. The discussion is based on four small example programs. Chapters 2 through 4 - These chapters provide a much more thorough treatment of the facilities sketched in Chapter 1. In particular, we treat the notion of data types, the basic statements in the language, and the facilities for writing

subprograms. Chapters 5 through 9 - These chapters describe the facilities needed in many important applications. In particular, we treat the development of program packages, parallel processing, exception handling, the interface with an implementation, and separate translation. GRA

N79-33898# George Washington Univ., Washington, D. C. Dept. of Electrical Engineering and Computer Science.
RASTER GRAPHICS EXTENSIONS TO THE GRAPHICS COMPATIBILITY SYSTEM (GCS) Final Report
James D. Foley, James Templeton, and Dara Dastylar Mar. 1979 82 p refs
(Contract DACA39-78-M-0073)
(AD-A070907; WES-MP-0-79-3) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report discusses a set of architectural extensions to line drawing graphics packages to support various raster displays. A series of subroutine calls and their functional descriptions are given. Specific recommendations are made on how to integrate the raster extensions into the Graphics Compatibility System (GCS). GRA

N79-33899# General Electric Co., Sunnyvale, Calif.
A SIMULATION MODELING APPROACH TO UNDERSTANDING THE SOFTWARE DEVELOPMENT PROCESS Final Report
J. A. McCall, G. U. Wong, and A. H. Stone Jun. 1979 100 p refs
(Contract F49620-78-C-0054; AF Proj. 2304)
(AD-A070960; AFOSR-79-0776TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report, prepared for the Air Force Office of Scientific Research (AFOSR), describes an assessment of the feasibility of utilizing simulation techniques to aid in the management of large-scale software developments. A model of the software development process was constructed, state-of-the-art prototype simulation tools used, and an experiment conducted to demonstrate the feasibility. A result of this effort is the concept of a Software Development Process Simulator which could be utilized to assist in project planning (cost estimation) and project control (progress status assessment). GRA

N79-33900# Battelle Columbus Labs., Ohio.
ASPECTS OF EFFECTIVE AUTHORING SYSTEMS AND ASSISTANCE: RECOMMENDATIONS FOR RESEARCH AND DEVELOPMENT
Karl L. Zinn (Mich. Univ., Ann Arbor) and Alfred Bork (Calif. Univ., Irvine) Sep. 1978 36 p
(Contract DAJC04-72-A-0001; DA Proj. 2Q7-63731-A-762) (AD-A071114; ARI-TR-78-A9) Avail: NTIS HC A03/MF A01 CSCL 09/2

This is one of a series of papers dealing with the authoring process and related problems in Computer-Based Instruction (CBI). It provides a brief historical background of computer based authoring systems, gives details of some of the contributions that the computer has made in the development of more effective teaching materials, outlines the most important aspects of the authoring process and provides some recommendations for future research and development. GRA

N79-33901# National Oceanic and Atmospheric Administration, Miami, Fla. Research Facilities Center.
RESEARCH AIRCRAFT MEASUREMENT SYSTEM (RAMS) GRAPHIC SYSTEM USER GUIDE
W. J. Brown Sep. 1978 32 p refs
(PB-296343/7; NOAA-TM-ERL-RFC-4; NOAA-79043003) Avail: NTIS HC A03/MF A01 CSCL 09B

The WP3-D aircraft data system is described. This system is used to analyze and display atmospheric and oceanic data collected by the aircraft. Its operation and its uses are explained. GRA

N79-33902# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
A MICROCOMPUTER SOFTWARE DEVELOPMENT SYSTEM
S. C. Stitt and T. R. Whittemore 1978 34 p
(PB-296568/9; REC-ERC-78-9) Avail: NTIS HC A03/MF A01 CSCL 09B

The software packages for use on the HP2100A minicomputer are presented. This system proved very successful in operation. The concepts contained are applicable for use by anyone involved in developing software for small microcomputers using absolute assembly language. GRA

N79-33903# National Technical Information Service, Springfield, Va.
COMPUTER SOFTWARE RELIABILITY, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Report, Jul. 1977 - Jun. 1979
Brian Carrigan Jul. 1979 193 p Supersedes NTIS/PS-78/0643; NTIS/PS-77/0572; NTIS/PS-76/0527; NTIS/PS-75/486
(NTIS/PS-79/0671/2; NTIS/PS-78/0643; NTIS/PS-77/0572; NTIS/PS-76/0527; NTIS/PS-75/486) Avail: NTIS HC$28.00/MF$28.00 CSCL 09B

The cited research includes computer software reliability modeling, software verification, and the evaluation of test tools for the measurement of software correctness. General discussions are included, along with the possibility of using hardware reliability models for testing software. This updated bibliography contains 182 abstracts, 62 of which are new entries to the previous edition. GRA

N79-33904# National Technical Information Service, Springfield, Va.
A DIRECTORY OF COMPUTER SOFTWARE APPLICATIONS: BIOMEDICAL TECHNOLOGY AND HUMAN FACTORS Report, 1970 - Mar. 1979
Mar. 1979 51 p
(PB-292724/2; NTIS/SA-79/04) Avail: NTIS HC $28.00/MF $28.00 CSCL 06B

Biomedical technology and human factors reports that list computer programs and/or their documentation are cited. These software applications pertain to topics, such as physiological measurements, environmental control, life support systems, image processing, pilot modeling, computer graphics, man-machine systems, and blood pressure measuring systems. The directory contains complete bibliographic data for each report as well as a subject and a corporate author index. The computer software offered by NTIS was created by a variety of Federal agencies to meet their diverse but quite specific objectives. It is provided without installation, support, or maintenance services and sometimes requires customer modifications to run effectively in customer environments. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N79-33905 Vanderbilt Univ., Nashville, Tenn.
FILE ASSIGNMENT IN A CENTRAL SERVER COMPUTER Ph.D. Thesis
Lawrence Gene Jones 1979 171 p
Avail: Univ. Microfilms Order No. 7922172

The placement of files among the nodes of a computer network and the impact on the performance of the network are examined. The formulations and methods for determining the optimal file placement are presented. A method to obtain file assignments for read-only files that allows replication of file copies is described and extended to read-write files with both non replication and replication of file copies. The network topology considered is the central server of star network topology. This topology also applies to a single computer system with the central processor unit as the central node and the peripheral input/output storage devices as the outlying nodes. The star network is analyzed using techniques that model the system as a network of queues. The measure of file assignment optimality used is maximum central node throughput. A.W.H.

N79-33906 State Univ. of New York at Stony Brook.
ANALYSIS OF RESPONSE TIME IN REAL-TIME SYSTEMS Ph.D. Thesis
Ahmed Mahjoub 1979 271 p
Avail: Univ. Microfilms Order No. 7922061

Three issues in designing software for microcomputer networks are identified and discussed. The mapping of the communication channels into buffered links of a two dimensional array architecture is studied. The behavior of the restricted model in terms of response time is analyzed. A graph theoretic model is defined for this analysis. Since requests may use the services of several microcomputers, they may encounter delays during their executions due to simultaneous competition for the same resources. The worst case delay that is encountered by a given request is estimated. A set of restrictions is imposed on the language to obtain a primitive model that is reasonably easy to analyze. Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N79-33907 Carnegie-Mellon Univ., Pittsburgh, Pa.
SEMI-DUAL APPROXIMATIONS FOR CONVEX OPTIMAL CONTROL PROBLEMS Ph.D. Thesis
George Dan Ianculescu 1979 266 p
Avail: Univ. Microfilms Order No. 7919145

The task of numerically approximating the solution of an optimal control problem with state and control constraints was considered. A semi-dual approach was developed which may solve the primal problem even in certain nonconvex cases and may use less work than the previous approach. After the general principles of the semi-dual method and some related existence results were presented, two basic issues were considered: error estimates for piecewise polynomial approximations; and numerical algorithms needed for the implementation of the semi-dual method. A computer software was applied to four test problems. The numerical experiments confirm the theoretical error estimates and validate our computer software. Dissert. Abstr.

N79-33908 Rice Univ., Houston, Tex.
NUMERICAL COMPUTATION OF OPTIMAL CONTROLS VIA CONJUGATE GRADIENT-RESTORATION TECHNIQUES Ph.D. Thesis
An-Kuo Wu 1979 81 p
Avail: Univ. Microfilms Order No. 7919648

The numerical solution of two classes of optimal control problems, called Problem P1 and P2 for easy identification are considered. Problem P1 involves minimizing a functional I subject to differential constraints and general boundary conditions. It consists of finding the state x(t), the control u(t), and the parameter pi so that the functional I is minimized, while the constraints and the boundary conditions are satisfied to a predetermined accuracy. Problem P2 extends Problem P1 to include nondifferential constraints to be satisfied everywhere along the interval of integration. Dissert. Abstr.

N79-33909# Illinois Univ. at Urbana-Champaign. Coordinated Science Lab.
A ROBUST CONTROL SYSTEM DESIGN Interim Report
Juergen E. Ackermann 1979 9 p refs
(Grant AF-AFOSR-3633-78)
(AD-A071162; AFOSR-79-0743TR) Avail: NTIS HC A02/MF A01 CSCL 09/3

A representation of controllable linear systems is introduced, which permits assigning poles or characteristic parameters to a state feedback system by a matrix multiplication. This is used as a link between state space and classical parameter plane methods. The system representation maps a point in a nxp dimensional parameter space of characteristic parameters into the nxp dimemsional parameter space of state feedback gains, where p is the number of actuators. For p counts one the coordinates of the characteristic parameter space are the coefficients of the closed loop characteristic polynomial, for p greater than one they are coefficients in a characteristic polynomial matrix and its determinant is the characteristic polynomial. By this computationally simple mapping procedure it becomes feasible to map not only a fixed set of eigenvalues but also regions in the s or z plane, in which the eigenvalues shall be located. This relaxation of the dynamic specifications permits satifying other typical design specifications like robustness with respect to sensor and actuator failures, large parameter variations, finite word length implementation, and actuator constraints. All tradeoffs between such requirements can be made in the feedback gain space. Three examples illustrate the variety of problems which can be tackled with this new tool. GRA

N79-33910# Maryland Univ., College Park. Lab. for Pattern Analysis.
PATTERN ANALYSIS AND MODELING Final Technical Report, 1 Sep. 1977 - 28 Feb. 1979
Laveen N. Kanal Apr. 1979 13 p refs
(Grant AF-AFOSR-2901-76; AF Proj. 2304)
(AD-A070961; AFOSR-79-0787TR) Avail: NTIS HC A02/MF A01 CSCL 09/4

Among the approaches to the search and extraction of structure in patterns summarized is a nondirectional parallel search algorithm which is shown to be better than the alpha-beta algorithm when dealing with game trees. New methodology for the design of hierarchial statistical classifiers includes use of state-space ordered search algorithms and introduction to heuristics to reduce the number of decision rules to be tried in a dynamic programming approach to optimizing the decision policies at the nodes of a decision tree. Contributions to the modeling of communication channels with memory, and models of data base query languages are also considered. GRA

N79-33911# Yale Univ., New Haven, Conn. Dept. of Computer Science.
THE USE OF STEREOTYPE INFORMATION IN THE COMPREHENSION OF NOUN PHRASES
Roger C. Schank and Michael Lebowitz May 1979 30 p
(Contract N00014-75-C-1111)
(AD-A070011; RR-144) Avail: NTIS HC A03/MF A01 CSCL 05/7

The importance of stereotypical information in natural language understanding is discussed. Two classes of words - those which create them - are presented. Combinations of such words, such as 'ambitious hippie' are examined for the clues they give about what should be part of the knowledge structure used to hold information about a person. The use of characterization in generating predictions to facilitate understanding is discussed. A program designed to investigate the problems in processing stereotypes is described, and examples of its operation are shown. GRA

N79-33912# University of Southern California, Los Angeles. Image Processing Inst.
ESTIMATION OF IMAGE SIGNALS WITH POISSON NOISE
Chun Moo Lo Jun. 1979 206 p refs
(Contract F33615-76-C-1203; ARPA Order 3119)
(AD-A071540; USCIPI-890) Avail: NTIS HC A10/MF A01 CSCL 05/8

An optimal filter in the sense of maximum a posteriori probability (MAP) is derived for image signals detected at low light levels. These signals suffer from Poisson noise and blurring degradations. The low level photon resolved image signal is modeled as an inhomogeneous Poisson point process. The photon noise is inherent in any detected image, and is particularly serious at low light levels. At these low light levels, the emission of photons is described by a Poisson point process, with the average rate of emission proportional to the integrated intensity. The blurring degradation model in the system includes space-variant and space-invariant effects such as atmospheric turbulence, linear motion, diffraction, and aberrations. The estimation is performed assuming that the photon events counted in each detector are independent, Poisson distributed random processes for the large time-bandwidth product case. GRA

N79-33913# Naval Research Lab., Washington, D. C.
ACCURACY OF AN INFORMATION-THEORETIC, LIGHT-LOAD APPROXIMATION FOR THE M/M/1 BUSY PERIOD PROBABILITY DENSITY Interim Report
J. E. Shore 11 Jul. 1979 14 p refs
(RR0140941)
(AD-A071885; NRL-MR-4037) Avail: NTIS

HC A02/MF A01 CSCL 09/4

An exponential approximation for the M/M/1 busy period probability density is derived by entropy maximization and studied numerically. The approximation is accurate for light loads: For load factors less than about .1, the approximation is accurate to within 10% in the range where the cumulative distribution function is as large as .95. GRA

N79-33914# Lincoln Lab., Mass. Inst. of Tech., Lexington.
REDUCTION OF QUANTIZATION NOISE IN PCM IMAGE CODING
J. S. Lim 1 May 1979 20 p refs
(Contract F19628-78-C-0002)
(AD-A071247; TN-1979-39; ESD-TR-79-79) Avail: NTIS HC A02/MF A01 CSCL 09/4

A new technique to reduce the effect of quantization in PCM image coding is presented in this report. The new technique consists of Roberts' pseudonoise technique followed by a noise reduction system. The technique by Roberts effectively transforms the signal dependent quantization noise to a signal independent additive random noise. The noise reduction system that follows reduces the additive random noise. Some examples are given to illustrate the performance of the new quantization noise reduction system. GRA

N79-33915# Brown Univ., Providence, R. I. Div. of Engineering.
CONTROL OF NONLINEAR SYSTEMS Interim Report, 1 Oct. 1978 - 31 May 1979
Allan E. Pearson 5 Jun. 1979 7 p refs
(Grant AF-AFOSR-2793-75; AF Proj. 2304)
(AD-A071200; AFOSR-79-0827TR; IPR-4) Avail: NTIS HC A02/MF A01 CSCL 12/1

Progress is described on a method for stabilizing linear differential systems by state variable feedback in which the gain matrix stems from the finite pure integration of the controllability Gramian and the resulting system tolerates a large class of nonlinearities in the loop without destroying stability. Research results are summarized for the theoretical investigation of minimum energy controls for a class of commutative bilinear systems which relate to a two-dimensional intercept control problem. Progress and research results are also described for a new equation error formulation for the least squares parameter estimation problem for nonlinear system identification and signal reconstruction. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N79-33916 Princeton Univ., N. J.
ON A CONJECTURE RELATING TO THE INVERSE SCATTERING METHOD TO PAINLEVE-TYPE EQUATIONS Ph.D. Thesis
Alfred Ramani 1979 100 p
Avail: Univ. Microfilms Order No. 7919778

The following conjecture was proposed: for any nonlinear partial differential equation or system solvable by the inverse scattering transform method, and for any ansatz that reduces it to a nonlinear ordinary differential equation or system, the resulting equation or system is of Painleve type, which means that its solutions have no movable singularities other than poles. An algorithm is described, which gives a necessary condition for an equation or a system to be of Painleve type. As an auxiliary problem, it is shown that it is not necessary to go through the formalism of the direct scattering problem to prove that the solution of the linear integral equation of Gel'fand-Levitan-Marchenko type is indeed a solution of the nonlinear differential equation it is supposed to solve. This is useful in connection with ordinary differential equations that might have no solutions with the properties necessary for the usual approach to make sense. Dissert. Abstr.

N79-33917 Texas Univ. at Austin.
UNITARY GROUP FORMULATION OF HARTREE FOCK AND RANDOM PHASE THEORIES Ph.D. Thesis
Constance Jane Nelin 1979 160 p
Avail: Univ. Microfilms Order No. 7920176

Open and closed shell restricted Hartree Fock theory is given a unitary group formulation. A generalized Brillouin's theorem is obtained from the extremum condition. From the stability condition, a generalized open shell random phase approximation (OSRPA) which generates stable excited states from stable HF ground state orbitals is obtained. The OSRPA treats excited states of any multiplicity and for triplets, yields more excited states than does conventional triplet RPA. The allyl double and butadiene singlet and triplet are treated in detail using the Hueckel-Hubbard Hamiltonian. The OSRPA results are compared with those of conventional triplet RPA for the butadiene triplet. Dissert. Abstr.

N79-33918 Wisconsin Univ. - Madison.
GENERALIZED FUNCTIONS AND BOUNDARY VALUE PROBLEMS Ph.D. Thesis
Ahmed I. Zayed 1979 110 p
Avail: Univ. Microfilms Order No. 7923458

The analytic representations of generalized functions given by Gebenbauer (ultraspherical series expansions) are studied and their singularities are determined to relate them to the singularities of the associated power series. A sufficient condition for the Abel summability of Gebenbauer series that converge to generalized functions, in terms of the values of the generalized functions at the points of summability, is derived. The generalized axially symmetric potentials and their boundary - values are characterized. Generalized functions given by Laguerre series are also studied. A characterization of a testing-function space S sub I is obtained in terms of the Laguerre coefficients of members of that space. Some boundary value problems in which the boundary values are given by elements in the dual space of S sub I are solved. The behavior at infinity of Laguerre series that converge to entire functions is investigated by relating the Borel transform of the entire function to the associated power series. Dissert. Abstr.

N79-33919 State Univ. of New York at Stony Brook.
NUMERICAL METHODS FOR SOLVING PARTIAL DIFFERENTIAL EQUATION WITH INADEQUATE DATA Ph.D. Thesis
Wei-Min Cheng 1979 115 p
Avail: Univ. Microfilms Order No. 7923460

It is found that the criteria for discretization of the differential equations of the finite difference method and the finite element method are unreliable for solving the inadequate data problem. A better and sharper criterion is adopted. It is to approximate the solution by a linear combination of the known data such that the norm of the pointwise error is minimized. The solution of the boundary-value problem L sub j u = f sub j, Bu = 0, where L is a linear partial differential operator and B is a homogeneous boundary operator, is approximated by u sub p = summation of (alpha sub j) (f sub j). Here alpha sub j's are to be determined by minimizing error functional in a Sobolev space. Emphasized are the sparsity of f sub j's. How to choose a suitable Sobolev space so that one can find reproducing kernel K with ease and use computer to demonstrate the advantages of the projection-like and collocation-like methods are the key points of this thesis. Dissert. Abstr.

N79-33920 North Carolina State Univ. at Raleigh.
FIXED POINTS OF NON-EXPANSIVE MAPPINGS AND ABSTRACT MEASURES OF NON-COMPACTNESS Ph.D. Thesis
Eric Walter Lee Chandler 1979 41 p
Avail: Univ. Microfilms Order No. 7923039

Nonexpansive maps on star-shaped sets are discussed as well as global and local fixed point theorems in which the nonexpansive mapping T shrinks a compact set away from its boundary somewhat. The retraction into the core is used to characterize nonexpansive and noncontractive subjections of a compact set as isometries. The ideal of a star-shaped set is abstracted to sets on which there exists a sequence of contractions approaching identity mapping. The construction and identification of locally contractive spaces is demonstrated. Dissert. Abstr.

N79-33921 Delaware Univ., Newark.
ASYMPTOTIC EXPANSIONS FOR THE SOLUTIONS OF PARABOLIC DIFFERENTIAL EQUATIONS WITH A SMALL PARAMETER Ph.D. Thesis
John Fleming Polk, Jr. 1979 219 p
Avail: Univ. Microfilms Order No. 7921828

Asymptotic expansions are constructed with respect to the parameter epsilon > 0 for solutions of the parabolic differential equation u sub t = epsilon [a(x)u sub xx + b(x)u sub x + c(x)u] and conditions are obtained for their validity as epsilon approaches 0. Both the Cauchy problem in the infinite domain R x [0,T] and the first initial-boundary value problem for the domain [x sub L, x sub R]x [0,T] are considered. An important feature of the discussion is the investigation into the effects of discontinuities in the initial and boundary conditions; moreover compatibility conditions are not assumed between the initial and boundary data at the corner points (x sub L,0) and (x sub R,0).
Dissert. Abstr.

N79-33922 State Univ. of New York at Albany.
EXTREME POINTS AND EXTREMAL PROBLEMS FOR CLASSES OF ANALYTIC FUNCTION Ph.D. Thesis
Yusuf Abdulaziz Abu-Muhanna 1979 81 p
Avail: Univ. Microfilms Order No. 7918815

The extreme points of F are determined when f is a convex bounded function which maps onto a domain D whose boundary delta D has a strong smoothness condition. Let Q denote the set of functions analytic in the open unit disc which preserve quadrants. The extreme points of A are characterized by having a radial limit which is real or imaginary almost everywhere. Families that generalize the idea of Q and determine their extreme points are described. Estimates on the initial coefficients of functions in these families are given. The regions of variability for the class of uniformly bounded functions are determined. Boundary points of these regions are shown to correspond uniquely to finite Blaschke products. The variability regions for the class of analytic functions subordinate to a given univalent function are determined as well as the form of solutions to extremal problems over these classes. Dissert. Abstr.

N79-33923# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MATHEMATICAL METHODS OF PHYSICS. 5: FUNCTIONS OF COMPLEX VARIABLES [METODOS MATEMATICOS DA FISICA. 5: FUNCOES DE VARIAVEL COMPLEXA]
Rene A. Medrano-B. May 1979 225 p refs In PORTUGUESE; ENGLISH summary Revised
(INPE-1494-RPE/038) Avail: NTIS HC A10/MF A01

The theory and functions of a complex variable are studied and their use in problem solving in physics is discussed. The concept of single value and multivaluedness of the functions is introduced by the concept of complex planes. Analytic functions and their properties, regular functions, Cauchy's theorem indefinite integral, and Cauchy's integral are studied. An analysis on complete series, tests of convergence, Taylor series, analytic continuation, and Laurent series is presented. The evaluation of real integrals by the use of the residue theorem is provided and a study is made of the gamma, beta, step, and other tabulated integral functions. A.W.H.

N79-33924*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
THE CLASSY CLUSTERING ALGORITHM: DESCRIPTION, EVALUATION, AND COMPARISON WITH THE ITERATIVE SELF-ORGANIZING CLUSTERING SYSTEM (ISOCLS)
R. K. Lennington and H. Malek Mar. 1978 37 p refs
(Contract NAS9-15200)
(NASA-CR-160344; LEC-11289) Avail: NTIS HC A03/MF A01 CSCL 12A

A clustering method, CLASSY, was developed, which alternates maximum likelihood iteration with a procedure for splitting, combining, and eliminating the resulting statistics. The method maximizes the fit of a mixture of normal distributions to the observed first through fourth central moments of the data and produces an estimate of the proportions, means, and covariances in this mixture. The mathematical model which is the basic for CLASSY and the actual operation of the algorithm is described. Data comparing the performances of CLASSY and ISOCLS on simulated and actual LACIE data are presented.
J.M.S.

N79-33925*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GEOPHYSICAL APPROACHES TO INVERSE PROBLEMS: A METHODOLOGICAL COMPARISON. PART 1: A POSTERIORI APPROACH
T. I. Seidman (Maryland Univ., Baltimore County) and M.-J. Munteanu Jun. 1979 23 p refs Submitted for publication
(NASA-TM-80301) Avail: NTIS HC A02/MF A01 CSCL 12A

The relationships of a variety of general computational methods (and variances) for treating illposed problems such as geophysical inverse problems are considered. Differences in approach and interpretation based on varying assumptions as to, e.g., the nature of measurement uncertainties are discussed along with the factors to be considered in selecting an approach. The reliability of the results of such computation is addressed.
J.M.S.

N79-33926*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF A NUMERICAL ORTHOGONAL COORDINATE GENERATOR TO AXISYMMETRIC BLUNT BODIES
Randolph A. Graves, Jr. Washington Oct. 1979 42 p refs
(NASA-TM-80131; L-13109) Avail: NTIS HC A03/MF A01 CSCL 12A

An application of a simple numerical technique which allows for the rapid construction of orthogonal coordinate systems about axisymmetric blunt bodies is presented. This technique can generate orthogonal meshes which have unequally spaced points in two directions. Relations are given for the numerical generation of the metric coefficients. Body shapes ranging from simple analytical bodies to complex reverse curvature bodies are presented together with their orthogonal coordinate systems. The relatively good accuracy of the technique is shown in tabular data describing coordinate line slopes and metric coefficients. The predictor-corrector numerical method used to generate these results is both simple in concept and easy to program, so that the application of the technique should be broader than the results presented. Author

N79-33927*# National Aeronautics and Space Administration, Washington, D. C.
COMPARATIVE ANALYSIS OF VARIOUS APPROACHES TO EVALUATING THE PARAMETERS OF MULTIDIMENSIONAL MODELS
L. S. Guran Oct. 1979 15 p refs Transl. into ENGLISH from Academy of Sciences USSR, Institute of Space Research, report PR-350 (Moscow) 1977 p 1-14 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75922) Avail: NTIS HC A02/MF A01 CSCL 12A

The problem of evaluating parameters of a multidimensional model according to measurement results is examined. The conditions on which the problem solution depends are itemized.
Author

N79-33928# Colorado State Univ., Fort Collins. Dept. of Mathematics.
A COMBINED REMES-DIFFERENTIAL CORRECTION ALGORITHM FOR RATIONAL APPROXIMATION Interim Report
E. H. Kaufman, Jr., D. J. Leeming, and G. D. Taylor Mar. 1979 17 p refs
(Contract AFOSR-76-2878; Grant NSF MCS-78-05847; AF Proj. 2304)
(AD-A071947; AFOSR-79-0857TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A numerical study is done comparing three algorithms for computing best rational approximations using the uniform (Chebyshev) norm. The experimental results and theoretical considerations indicate that the Remes-difcor algorithm is superior as a general-purpose routine to both the widely-used Remes algorithm and the differential correction algorithm. The three

algorithms are briefly described and discussed, and the experimental results for 70 examples are presented in six tables. GRA

N79-33929# Colorado State Univ., Fort Collins. Dept. of Mathematics.
CONTINUITY OF BEST RECIPROCAL POLYNOMIAL APPROXIMATION ON [0, INFINITY) Interim Report
Charles B. Dunham and G. D. Taylor Apr. 1979 15 p refs
(Grants AF-AFOSR-2878-76; NSF MCS-78-05847)
(AD-A071946; AFOSR-79-0856TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Continuity of the best approximation operator is studied for approximating continuous positive functions tending to zero as x approaches infinity by reciprocals of polynomials on - 0, infinity is studied. Both negative and positive results are obtained. GRA

N79-33930# Michigan Univ., Ann Arbor. Human Performance Center.
CONSTRAINED NONMETRIC MULTIDIMENSIONAL SCALING
Elliot Noma and Janice Johnson Jun. 1979 35 p refs
(Contract N00014-76-C-0648)
(AD-A071611; Rept-014523-5-T; TR-62) Avail: NTIS HC A03/MF A01 CSCL 12/1

One of the most crucial aspects of most multidimensional scaling procedures is that the lowest-stress configuration is the output produced. Unfortunately, little is known about the uniqueness of a configuration generated from fallible data, yet this affects the interpretation of the spatial output. It is possible, however, to examine the uniqueness of a scaled solution by constraining the configuration to conform to a particular psychological model. A multidimensional scaling program, CONSCAL, which will allow the imposition of such constraints, is proposed. The implications of this approach for interpreting scaling outputs and for model testing in general are discussed. GRA

N79-33931# Michigan Univ., Ann Arbor. Human Performance Center.
INTERSESSION VARIABILITY AND STRESS: A MONTE CARLO STUDY
Elliot Noma Jun. 1979 28 p refs
(Contract N00014-76-C-0648)
(AD-A071612; Rept-014523-6-T; TR-63) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two Monte Carlo studies explore the relation of the tau measure of intersession response variability and the stress of the corresponding multidimensional scaling solution, thereby providing a statistical basis for evaluating the goodness-of-fit of a spatial configuration. In the first Monte Carlo study, the stress and tau of 10-, 16-, and 30-point configurations in 1, 2, 3, and 4 dimensions are shown to be linear functions of the internal error level. In the second study, these relations are shown to be relatively invariant with respect to the particular configurations. Three methods are proposed for establishing acceptable levels of stress for heuristic and for constrained multidimensional scaling. GRA

N79-33932# Kentucky Univ., Lexington. Dept. of Mathematics.
STOCHASTIC REALIZATION AND INVARIANT DIRECTIONS OF THE MATRIX RICCATI EQUATION Interim Report
Michele Pavon 1979 63 p refs
(Grants AF-AFOSR-3519-78; NSF MPS-77-00241; NSF MPS-75-0702; AF Proj. 2304)
(AD-A070972; AFOSR-79-0807TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Invariant directions of the Riccati difference equation of Kalman filtering are shown to occur in a large class of prediction problems and to be related to a certain invariant subspace of the transpose of the feedback matrix. The discrete time stochastic realization problem is studied in its deterministic as well as probabilistic aspects. In particular, a new derivation of the classification of the minimal Markovian representations of the given process z is presented which is based on a certain backward filter of the innovations. For each Markovian representation which can be determined from z, the space of invariant directions is decomposed into two subspaces, one on which it is possible to predict the state process without error forward in time and one on which this can be done backward in time.GRA

N79-33933# Naval Civil Engineering Lab., Port Hueneme, Calif.
MATHEMATICAL THEORY OF THE FINITE ELEMENT METHOD: SOME INTRODUCTORY ASPECTS Final Report, Oct. 1977 - Dec. 1978
Theodore A. Shugar Apr. 1979 43 p refs
(AD-A070861; CEL-TN-1552) Avail: NTIS HC A03/MF A01 CSCL 12/1

The mathematical prerequisites from functional analysis that enable the understanding of the mathematical theory of finite element are organized, presented, and explained. They begin with the definition of linear vector spaces and include all intermediate definitions up to the definition of Hilbert spaces. The Ritz approximate solution method for boundary value problems is developed so that the close similarity between it and the finite element method can be observed. Solutions given by the Ritz method are projections of the true solution vector onto a subspace defined by the governing differential equations and boundary conditions. Finite element shape functions are shown to be superior to classical Ritz functions as basis vectors in the Ritz process. The finite element and Ritz methods differ primarily in the choice of continuous functions for the basis vectors. The shape functions are therefore primarily responsible for the wide acceptance and popularity of the finite element method. GRA

N79-33934# Wisconsin Univ. - Madison. Mathematics Research Center.
ON THE NUMBER OF SOLUTIONS TO POLYNOMIAL SYSTEMS OF EQUATIONS Summary Report
C. B. Garcia and T. Y. Li Apr. 1979 15 p refs
(Contract DAAG29-75-C-0024; Grants DAAG78-G-0160; NSF MCS-77-15509; NSF MCS-78-09525; NSF MCS-78-02420)
(AD-A070210; MRC-TSR-1951) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that for almost every system of n polynomial equations in n complex variables, the number of solutions q is shown by an equation. The proof of this result is done in such a way that all q solutions can be explicitly calculated for almost all such systems. GRA

N79-33935# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
THE CONSTRAINT METHOD FOR SOLID FINITE ELEMENTS
I. Norman Katz Sep. 1977 22 p refs
(Grant AF-AFOSR-3122-77; AF Proj. 2304)
(AD-A071069; AFOSR-79-0844TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

With an exception, all finite element software systems have element libraries in which the approximation properties of elements are frozen. The user controls only the number and distribution of finite elements. The exception is an experimental software system, called COMET-X, which employs conforming elements based on complete polynomials of arbitrary order. The elements are hierarchic; i.e., the stiffness matrix of each element is embedded in the stiffness matrices of all higher order elements of the same kind. The user controls not only the number and distribution of finite elements but their approximation properties as well. Thus convergence can be achieved on fixed mesh. This provides for very efficient and highly accurate approximation and a new method for computing stress intensity factors in linear elastic fracture mechanics. The theoretical developments are outlined, numerical examples are given and the concept of an advanced self-adaptive finite element software system is presented. GRA

N79-33936# SRI International Corp., Menlo Park, Calif. Computer Science Lab.
A THEOREM-PROVER FOR RECURSIVE FUNCTIONS: A USER'S MANUAL
Robert S. Boyer and J. Strother Moore Jun. 1979 66 p refs
(Contract N00014-75-C-0816; Grant NSF MCS-76-81425)
(AD-A070905; SRI/CSL-91) Avail: NTIS HC A04/MF A01 CSCL 09/2

A user's manual for an automatic theorem-proving computer

program is presented. We here describe how to use the program, which is written in the INTERLISP dialect of LISP. Matters covered include our syntactic conventions; starting up the theorem-prover; defining functions; proving and storing lemmas; undoing previous work; and examining and saving the theorem-prover's state. More than 30 user commands are defined and described. Simple examples are given. GRA

N79-33937# University of Southern Illinois at Carbondale. Dept. of Mathematics.
APPROXIMATION WITH EXPONENTIAL SUMS Final Report, 1 Mar. 1974 - 28 Feb. 1979
David W. Kammler 28 Feb. 1979 10 p refs
(Grant AF-AFOSR-2653-74)
(AD-A071122; AFOSR-79-0759TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

One major accomplishment has been the devising of a very general theory for establishing the existence of a best approximation to an arbitrary function by an exponential sum of a given order. A second result was the creation of a mathematical theory and workable numerical methods for constructing best Chebyshev, least mean, and least squares approximations for a given completely monotonic function by sums of exponentials. Finally, the compilation and publication of a bibliograph for approximation with exponential sums by the principal investigator will undoubtedly be of enormous value to others working in this area. GRA

N79-33938# South Carolina Univ., Columbia. Dept. of Mathematics, Computer Science and Statistics.
ON THE NONEXISTENCE OF GLOBALLY BOUNDED SOLUTIONS TO INITIAL-HISTORY VALUE PROBLEMS FOR INTEGRODIFFERENTIAL EQUATIONS Interim Report
Frederick Bloom 18 Jun. 1979 22 p refs
(Grant AF-AFOSR-3396-77; AF Proj. 2304)
(AD-A071163; AFOSR-79-0831TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Conditions are given under which it is impossible that there exist a solution of the integrodifferential initial-history value problem which lies in a class of bounded perturbations. An application is given to the nonexistence of globally bounded solutions, to initial-history boundary value problems for Maxwell-Hopkinson dielectrics, which lie in classes of bounded functions. GRA

N79-33939# State Univ. of New York at Buffalo. Dept. of Electrical Engineering.
EXTRAPOLATION AND SPECTRAL ESTIMATION TECHNIQUES FOR DISCRETE TIME SIGNALS Progress Report, 17 May - 30 Oct. 1978
Anil K. Jain and Surendra Ranganath Griffiss AFB, N.Y. RADC May 1979 111 p refs Prepared in cooperation with Calif. Univ., Davis
(Contract F30602-75-C-0122; Grant DAAG29-78-A-0206; AF Proj. 4506)
(AD-A071155; RADC-TR-79-124) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report considers spectral estimation and extrapolation techniques for discrete time, band limited signals, (i.e., signals whose bandwidth is less than 1/T cycles; if T sec. is the sampling interval) which are observable only for a finite duration. The objective is to determine the spectrum (or power spectrum)of these signals. It is shown that the estimated spectrum can be improved considerably (over a periodgram or Maximum entropy spectrum) by first extrapolating the given observations beyond the observation interval. Also, we consider the problem of extrapolation of signal in the presence of noise or other interfering signals. Several new results and algorithms are presented. First, it is shown that some of the existing extrapolation methods for continuous signals when extended to sampled data do not converge to the exact original time-unlimited signal. Rather, one only expects to get a minimum norm least squares estimate. And, we find that Papoulis' 8 iterative extrapolation algorithm is a special case of a gradient algorithm with linear convergence. It is shown that an infinite extrapolation matrix introduced in 10 does not exist and is ill conditioned at best when approximated to a finite matrix. The new extrapolation algorithms include a discrete prolate spheroidal wave function (PSWF) expansion, a conjugate gradient iterative algorithm, a mean square extrapolation filter and recursive Kalman filter type extrapolation. GRA

N79-33940# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF SOME CHARACTERISTICS OF FINITE ELEMENT AND FINITE DIFFERENCE CALCULATIONS OF TRANSIENT THERMAL PROBLEMS
A. F. Emery, K. Sugihara, and A. T. Jones Apr. 1979 27 p refs
(Contract EY-76-C-04-0789; DE-AC04-76DP-00789)
(SAND-78-8047) Avail: NTIS HC A03/MF A01

Short-time transient thermal problems were studied by using the finite element and finite difference methods. It is shown that the overshoot arises because the element method yields an upper bound to the eigenvalues. Under some conditions, the finite element method can be improved, but in general the overshoot cannot be eliminated. Because the finite difference method yields a lower bound to the eigenvalues, no such overshoot exists, and this method is to be preferred if very short time responses are desired near boundaries which undergo abrupt changes in temperature. DOE

N79-33941# National Bureau of Standards, Washington, D. C. Center for Applied Mathematics.
UTILITY AND USE OF LARGE-SCALE MATHEMATICAL MODELS
Saul I. Gass May 1979 219 p refs Proc. of a Workshop held at Gaithersburg, Md., 28-29 Apr. 1977
(PB-296255/3; NBS-SP-534; LC-79-600045) Avail: NTIS HC A10/MF A01 CSCL 12B

The specific problem areas addressed included: the present status of model use in DOD and non-DOD applications, issues facing developers, problems of model implementation, transfer and development in the energy field, model assessment and evaluation, use in policy analysis, comparison of models, management of the modeling process, model software and documentation, and guidelines, standards and management improvement activities. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N79-33942 University of South Florida, St. Petersburg.
CLASSICAL AND BAYESIAN ANALYSIS OF SURVIVAL SYSTEMS Ph.D. Thesis
Christine Hall Deans 1979 218 p
Avail: Univ. Microfilms Order No. 7922879

The problem of survival estimation is addressed with special consideration given to the Makeham-Gompertz distribution as a failure model. Parametric and nonparametric techniques as well as combinations of the two are examined. To investigate the sensitivity of Bayes estimates of survival to changes either in the prior or in the loss function, a measure of robustness is defined for each situation. After the mathematical derivations for these measures are obtained, computer calculations are performed to compare the gamma prior with the uniform prior and with the exponential prior. Further calculations allow the squared error loss function to be compared with the squared relative error loss function and with the Harris loss function. In all cases considered, Bayes estimates of survival are found to be sensitive both to the choice of the prior density and to the choice of a loss function. Dissert. Abstr.

N79-33943 Rochester Univ., N. Y.
SOME RESULTS ON ESTIMATING VARIANCE COMPONENTS IN UNBALANCED DESIGNS Ph.D. Thesis
Jack S. Kaplan 1979 180 p
Avail: Univ. Microfilms Order No. 7922940

Results concerning the MINQUE and other estimation methods are presented. These include: (1) simplified, easily computable expressions for the MINQUE when there is only one random factor; (2) a theorem relating the unweighted means and weighted MINQUE estimators in the one-way unbalanced design; (3) a method for determining whether a given

estimator in a given design coincides with one of the weighted MINQUE estimators; (4) a derivation of P.S.R.S. Rao and Chaubey's average squared residual (ASR) estimator; (5) a proposed new class of biased estimators; and (6) numerical and simulation studies comparing various estimators of the treatment variance and the mean parameter in the one-way unbalanced design. Dissert. Abstr.

N79-33944 Georgia Univ., Athens.
ANALYSIS OF UNBALANCED MULTI-FACTOR HIERARCHICAL DESIGNS Ph.D. Thesis
Mike Wenjau Wang 1979 254 p
Avail: Univ. Microfilms Order No. 7923158

The theory, algorithm, and computer programs are presented for analysis of categorized multiple factor unbalanced designs, including empty cells. The dependency relationship of the hierarchical assumptions is employed to reduce the over parametrized design matrix to a full rank matrix, to handle missing cells, and to obtain estimates of the independent and dependent effects. Adjusted means are obtained by summing all relevant effect estimates according to the general design model. Comparisons of effect estimates, adjusted means, and analysis of variance results are made with SAS, Harvey, and SPSS statistical programming packages. Algorithms of obtaining confidence bounds for main effect contrasts are also described. A user guide describing the setup procedure for access of the hierarchical design program on CDC Cyber 70/74 is included. Detailed tables and program listings are contained in the appendix. Dissert. Abstr.

N79-33945# Rochester Univ., N. Y. Dept. of Statistics.
THE LOGIT METHOD FOR COMBINING TESTS Interim Report
E. Olusegun George 1979 26 p refs
(Grant AF-AFOSR-3360-77; AF Proj. 2304)
(AD-A071060; AFOSR-79-0742TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A new combination statistic, the sum of the logits of P-values is introduced and its standardized form is found to be essentially equivalent to a standardized Student t in null distribution. Comparisons with Fisher's omnibus procedure by Bahadur ARE, membership in a complete class of tests and a Monte Carlo simulation of the power functions, show that both procedures are equivalent by the first criterion and neither procedure is generally dominant by either of the two criteria. GRA

N79-33946# Stanford Univ., Calif. Information Systems Lab.
SYSTEM MODELING AND STATISTICAL DATA PROCESSING Final Report, 1 Apr. 1974 - 31 May 1979
T. Kailath 31 Mar. 1979 21 p refs
(Contract F44820-74-C-0068; AF Proj. 2304)
(AD-A070967; AFOSR-79-0788TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Square root, least squares estimation algorithms are examined from the viewpoint that square root arrays are arrays expressing relevant problem random variables in terms of basis sets of orthonormal (identity covariance) random variables. With this viewpoint, projection-theorem arguments can be expressed directly in the square root arrays, giving simple, geometric derivations of square root algorithms. A unifying framework is provided for previously proposed square root algorithms (and square-root-free factorization algorithms), and several new square root estimation procedures are derived. Square root techniques for determining the actual error covariance of a state estimate based on an incorrect model are extended. The ease with which either of two previously proposed techniques may be used with either the covariance or the information form of the estimator is enhanced. The two techniques are compared, and some guidance is provided as to when the use of each is advantageous. Square root error analysis is extended to the smoothing problem. GRA

N79-33947# Kentucky Univ., Lexington. Dept. of Mathematics.
A STOCHASTIC REALIZATION APPROACH TO THE SMOOTHING PROBLEM Interim Report
Anders G. Lindquist, Faris Badawi, and Michele Pavon 1979 32 p refs
(Grant AF-AFOSR-3519-78)
(AD-A071103; AFOSR-79-0808TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this paper is to develop a theory of smoothing for finite dimensional linear stochastic systems in the context of stochastic realization theory. The basic idea is to embed the given stochastic system in a class of similar systems all having the same output process and the same Kalman-Bucy filter. This class has a lattice structure with a smallest and a largest element, these two elements completely determine the smoothing estimates. This approach enables us to obtain stochastic interpretations of many important smoothing formulas and to explain the relationship between them. GRA

N79-33948# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
A RELATIONSHIP BETWEEN GENERALIZED AND INTEGRATED MEAN SQUARED ERRORS Interim Report
R. F. Gunst and J. L. Hess (Kansas State Univ., Manhattan) 1979 8 p refs
(Grant AF-AFOSR-2871-75; AF Proj. 2304)
(AD-A071201; AFOSR-79-0811TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Generalized mean squared error is a flexible measure of the adequacy of a regression estimator. It allows specific characteristics of the regression model and its intended use to be incorporated in the measure itself. Similarly, integrated mean squared error enables a researcher to stipulate particular regions of interest and weighting functions in the assessment of a prediction equation. The appeal of both measures is their ability to allow design or model characteristics to directly influence the evaluation of fitted regression models. In this note an equivalence of the two measures is established for correctly specified models. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N79-33949# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
EFFECTS OF LINEAR TREND AND MEAN VALUE ON MAXIMUM ENTROPY SPECTRAL ANALYSIS
R. P. Kane and N. B. Trivedi Sep. 1979 20 p Revised
(INPE-1568-RPE/069) Avail: NTIS HC A02/MF A01

Using artificial samples, it is shown that, even for the maximum entropy method (MEM) of spectral analysis of time series, a presence of a linear trend gives distortions in the low frequency (high periodicity) region and hence, it is advisable that linear trends be eliminated before subjecting a sample to MEM spectral analysis. Very large mean values reduce the sharpness of the peaks; but a sample expressed as deviations from mean does not necessarily give the best resolution. A mean of the same order of magnitude as the amplitude of the simusoids involved seems to provide better accuracy. Examples of some physical parameters for which results of spectral analysis by MEM are reported in recent literature, are discussed. Author

N79-33950# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE EQUILIBRIUM STATE
J. A. Bittencourt Jul. 1979 50 p
(INPE-1518-RPE/054) Avail: NTIS HC A03/MF A01

A simple derivation of the Maxwell-Boltzmann velocity distribution function is presented which is based on the general principle of detailed balance from statistical mechanics, and the concept of summation invariants. The physical meaning of the Maxwell-Boltzmann distribution function is discussed and its properties are analyzed. It is shown that the equilibrium distribution function is the most probable distribution consistent with the macroscopic constraints of the system, and it is also the state having maximum entropy. A derivation is given for the equilibrium distribution function in the presence of an external conservative force, and the Boltzmann factor is introduced. Finally, an analysis of the Saha equation, which specifies the degree of ionization of a gas in thermodynamic equilibrium at a given temperature is presented. G.Y.

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N79-33951 California Univ., Los Angeles.
GENERALIZED LIE SUPERALGEBRAS Ph.D. Thesis
Jeffrey Steven Freedman 1979 66 p
Avail: Univ. Microfilms Order No. 7921400

A generalization is given of Kac's definition to Lie superalgebras graded over any finite Abelian group G by replacing the factor (-1) superscript deg(x) of deg(y) with f of deg(x), deg(y), where f is a function of G times G. It was shown that restrictions must be placed on f, and also how to construct a G-graded Lie superalgebra from a G graded associative algebra. Other properties of the function f were derived, and examples are given.
Dissert. Abstr.

N79-33952 California Univ., Los Angeles.
THE USE OF THE LIMIT THEORY OF HARRIS-RECURRENT MARKOV CHAINS IN DEFINING SOLUTIONS TO TWO-PERSON NONCOOPERATIVE GAMES Ph.D. Thesis
Christopher Leigh Cagan 1979 128 p
Avail: Univ. Microfilms Order No. 7921372

The concept of the limit behavior of a system of players is used. Two players considered as playing the same again and again, updating their mixed strategies according to their experiences in playing the game. This leads to defining a Markov chain on the uncountable state space of all mixed strategy pairs. The limit behavior of the system defines the solution to the game. The theory of Harris-recurrent chains is used to make statements about the limit behavior of the system.
Dissert. Abstr.

N79-33953 Pennsylvania State Univ., University Park.
THE THEORY OF PROFINITE GROUPS WITH EFFECTIVE PRESENTATIONS Ph.D. Thesis
Rick L. Smith 1979 93 p
Avail: Univ. Microfilms Order No. 7922347

Profinite groups in an effectively computable (recursive) setting are studied. Theorems developed include: (1) There is a co-r.e. profinite group which is not isomorphic to any recursively profinite group and a profinite group in which every pair of distinct nonidentity elements have incomparable Turing degrees; (2) there are profinite groups refuting that the center of G is co-r.e. Frattini or p-Sylow subgroup; (3) the continuous cross section theorem for profinite groups is effectively false; (4) if G is a superminimal recursively profinite group, then G is approximately equal to a p-adic integer; (5) if G is superminimal and either Abelian or pro-p, then G approximately equals a p-adic or integer a cyclic group of some order p; and (6) there is a non-Abelian superminimal group. Theorems concerning autostability are also discussed.
Dissert. Abstr.

N79-33954 California Univ., San Diego.
A SET-VALUED STRONG DERIVATIVE IN INFINITE DIMENSIONAL SPACES, WITH APPLICATIONS IN HILBERT SPACES Ph.D. Thesis
Theodore Higgins Sweetser, III 1979 112 p
Avail: Univ. Microfilms Order No. 7921501

It is shown that set-valued derivatives called shields extend the concept of strong derivative and that with some restrictions they satisfy sum, product and chain rules, the inverse and implicit function theorems, and the rules for Lagrange multipliers. A set of linear transformations is a shield for a function f at a point x if for any neighborhood of the set there is a neighborhood of x such that for any two points x sub 1 and x sub 2 there is a linear transformation near (or in) the set satisfying A(x sub 1)-A(x sub 2) = f(x sub 1) - f(x sub 2). The concept of a linear transformation being onto is extended to a set of linear transformations having positive coverage. In the Banach space setting, there is a ball around the origin of the range space which is contained in the image of the unit ball in the domain space. The concept of plenarity is explored in the Banach space setting. If certain restrictions are met, a plenary, convex set has the same closure in both the weak operator and uniform operator topologies on the space berween two Banach spaces.
Dissert. Abstr.

N79-33955 Lehigh Univ., Bethlehem, Pa.
ADMISSIBLE NET FAMILIES: A GENERAL FRAMEWORK FOR THE STUDY OF SEQUENTIAL PROPERTIES, K-PROPERTIES AND RELATED IDEAS Ph.D. Thesis
David Brian Anderson 1979 162 p
Avail: Univ. Microfilms Order No. 7919968

A closure operator is defined in terms of a class of nets called admissible nets and it is shown that many sequential properties and k-space properties are easily expressed. An ordinary function is introduced that, in some sense, measures how good the closure operator is. In the setting of locally convex spaces, some completeness theorems are expressed in terms of closure properties of the dual and the ordinary function SEQ to derive a norming theorem is used. Characterization of sequential subspaces is given and some relationships between sequential properties and various forms of compactness are derived. Characterization of k-subspaces are also given and two properties related to k-spaces are examined: CK, the closure of a compact set is compact; and KLK, every compact set is locally compact in the relative topology.
Dissert. Abstr.

N79-33956 Pennsylvania Univ., Philadelphia.
THE CLASSIFICATION OF GROUP SCHEMES OF RANK PQ Ph.D. Thesis
Marjory Jean Baruch 1979 66 p
Avail: Univ. Microfilms Order No. 7919426

The problem of the structure of group schemes over fairly general base schemes was discussed. The case of flat group schemes of order pq where p and q are primes and q greater than p was pointed out. In this case, building on results of Tate and Oort who studied the case of group schemes of prime order, the group schemes of rank pq were classified over base schemes of the type indicated in the article of Tate and Oort. The exceptional cases not covered by the theorem were studied and a theory of extensions and actions of one group scheme on another, especially as it pertains to problem of classification mentioned above was given.
Dissert. Abstr.

N79-33957 Pennsylvania Univ., Philadelphia.
REPRESENTATION THEORY OF AN INFINITE-DIMENSIONAL UNITARY GROUP Ph.D. Thesis
Robert Paul Boyer 1979 85 p
Avail: Univ. Microfilms Order No. 7919432

The problem of extending the Borel-Weil realization for the irreducible representations of compact Lie groups via holomorphic induction to the infinite-dimensional group, G, of unitary operators on a separable Hiblert space is studied. A canonical equivalence between a strongly continuous irreducible unitary representation of G, Ind(f,hol), and a tensorial realization of the same representation is established when f satisfies in addition a negativity condition. It is established that any norm continuous factor representation of G is a multiple of an irreducible representation so that pi is type 1, and that the norm continuous irreducible representations are parameterized, up to unitary equivalence, by a pair of finite lists of decreasing positive integers. If the norm continuity assumption is dropped, then G admits strongly continuous type 2 sub 1 factor representations. Hence, G is not a type 1 group.
Dissert. Abstr.

N79-33958 Pennsylvania State Univ., University Park.
COMPUTATIONAL COMPLEXITY OF SORTING AND SELECTION OF SETS WITH STRUCTURE AND RELATED RESULTS Ph.D Thesis
Samuel David Kashdan 1979 133 p
Avail: Univ. Microfilms Order No. 7922301

The time complexity of sorting and selection problems posed on sets which have structure is exemplified by considering the additive set of pairs X+Y. A priori knowledge of the structure imposed allows for the construction of improved algorithms for sorting or for selecting the K-th ranked member of the structured set. Lower and upper time bounds are derived from RAMs and various comparison models. For certain generalizations of the X+Y structure in which structured set members contain more additions, sorting and selection problems are shown to be NP-hard. In light of the apparent intractability of these problems, probabilistic, approximation, and preprocessing techniques are combined to provide improved running time bounds for solution

of a certain class of intractible problems. These techniques also prove to be applicable to problems of X+Y. Dissert. Abstr.

N79-33959# Rice Univ., Houston, Tex. Dept. of Electrical Engineering.
NONLINEAR SYSTEM IDENTIFICATION BASED ON A FOCK SPACE FRAMEWORK Final Report
L. V. Zyla and Rui J. P. deFigueiredo May 1979 48 p refs
(Contract N00014-79-C-0442)
(AD-A071063; EE-TR-7901) Avail: NTIS HC A03/MF A01 CSCL 09/4

A method is presented for the identification of a nonlinear system represented by an operator V:E yields Y, where the input space E is a separable Hilbert space over the field of complex numbers and the output space Y is the Sobolev space H(n)-squared of complex-valued functions y on an interval I of the real line such that dky/dtk, k=0,...,n-1, are absolutely continuous and dny/dtn and element of L-squared (I). The above developments permit us to obtain the solution to our nonlinear system identification problem as the solution to an appropriate minimum norm problem in B(n)-squared (I.F sub rho(E)). Procedures for obtaining both the noncausal and causal solutions are given. We also introduce the concept of (epsilon-causality), which is weaker than that of causality, and derive an epsilon-causal solution to our problem. The case when measurement errors are present is finally considered. The results are illustrated by the computer simulation of a simple example in which very good agreement with the theory is obtained over a wide time-interval. GRA

N79-33960# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
SOME CONNECTION BETWEEN MATHEMATICAL LOGIC AND COMPLEXITY THEORY
Richard A. DeMillo and Richard J. Lipton (Calif. Univ., Berkeley) Apr. 1979 24 p refs
(Grants DAAG29-76-G-0338; NSF MCS-78-81486; NSF MCS-78-07379; NSF MCS-78-01689)
(AD-A071719; GIT-ICS-79/01; ARO-14690.9-EL) Avail: NTIS HC A02/MF A01 CSCL 12/1

The existence of lower bounds for problems in NP intersection coNP is equivalent to the existence of nonstandard, noneffective models of a fragment, PT, of complete arithmetic. A typical corrollary is that factoring integers is intractable if there is a model of arithmetic in which primes fail to have primitive roots. Following from the proof of the main result is an existential proof procedure for polynomial time algorithms. GRA

N79-33961# California Univ., Berkeley. Operations Research Center.
A THEOREM CONCERNING CYCLIC DIRECTED GRAPHS WITH APPLICATIONS TO NETWORK RELIABILITY
Randall R. Willie Dec. 1978 18 p refs
(Contracts N00014-75-C-0781; EC-77-S-01-5101)
(AD-A071440; ORC-78-23) Avail: NTIS HC A02/MF A01 CSCL 12/1

In a recent paper, Satyanarayana and Prabhaker have presented a new topological formula for evaluating exact reliability of terminal-pair directed networks. Terms in the formula are associated in a one-to-one fashion with certain cyclic subgraphs of the network, cyclic subgraphs being of no importance. In their paper, however, the proof that cyclic subgraphs may be ignored seems to be incomplete. We consider an alternate proof of this fact. GRA

N79-33962# Texas Univ. at Austin. Dept. of Physics.
UNSTABLE QUANTUM STATES AND RIGGED HILBERT SPACES
V. Gorini and G. Parravicini Oct. 1978 11 p refs Presented at the 7th Intern. Colloq. on Group Theoret. Methods in Phys., Austin, Texas, 14 Sep. 1978
(Contract EY-76-S-05-3992)
(ORO-3992-351; Conf-781088-1) Avail: NTIS HC A02/MF A01

Rigged Hilbert space techniques are applied to the quantum mechanical treatment of unstable states in nonrelativistic scattering theory. A method is discussed which is based on representations of decay amplitudes in terms of expansions over complete sets of generalized eigenvectors of the interacting Hamiltonian, corresponding to complex eigenvalues. These expansions contain both a discrete and a continuum contributions. The form corresponds to eigenvalues located at the second sheet poles of the S matrix, and yields the exponential terms in the survival amplitude. The latter arises from generalized eigenvectors associated to complex eigenvalues on background contours in the complex plane, and gives the corrections to the exponential law 27 references. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N79-33963# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MOTION OF CHARGED PARTICLES IN CONSTANT AND UNIFORM ELECTROMAGNETIC FIELDS
J. A. Bittencourt Jul. 1979 49 p Revised
(INPE-1506-RPE/046) Avail: NTIS HC A03/MF A01

The motion of individual charged particles in the presence of electric and magnetic fields, which are constant in time and uniform in space are analyzed. The fields are assumed to be prescribed and, therefore, are not affected by the presence of the charged particles. The problem is analyzed in steps, using the nonrelativistic equations of motion, incorporating separately in the theory the effects associated with only the electric field, or only the magnetic field, and the effects which are due to both electric and magnetic fields. A.W.H.

N79-33964# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
SUMMARY OF WORK ON COOLED ION FREQUENCY STANDARD Annual Report, Sep. 1978 - Aug. 1979
D. J. Wineland and F. L. Walls 15 Jun. 1979 6 p
(Contract N00014-77-F-0046; RR0110301)
(AD-A070805) Avail: NTIS HC A02/MF A01 CSCL 20/12

The purpose of this work is to develop techniques to overcome the fundamental limits of present frequency standards--the second and residual first-order Doppler shifts. To this end we study suitable frequency reference transitions in ions which are stored in electromagnetic traps and cooled by radiation pressure to ~1K. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N79-33965 Delaware Univ., Newark.
MEASUREMENT OF ACOUSTIC ADMITTANCES USING A RESONANCE METHOD Ph.D. Thesis
Robert James Miller 1979 119 p
Avail: Univ. Microfilms Order No. 7921837

The acoustic admittance is measured using the resonance modes of a rectangular resonator. The nth mode is characterized by a center frequency E sub n and half-width gamma sub n and in general, by a different angle of incidence at each of the three sets of opposing walls of the resonator. A calculator based automatic data acquisition system is used to measure the in phase and quadrature response for frequencies near each resonance. These data are fitted to a theoretical response expression to determine E sub n and gamma sub n. The shift to E sub n and gamma sub n accompanying the complete or partial replacement of one wall by the sample of absorbing material is related to the admittance of the sample. Boundary perturbation theory is used for the case of partial wall replacement. An exact relationship is used for full wall replacement. Dissert. Abstr.

N79-33966 Pennsylvania State Univ., University Park.
TRANSIENT ACOUSTIC RADIATION FROM ELASTIC PLATES Ph.D. Thesis

Sengerdy Mackertich 1979 111 p
Avail: Univ. Microfilms Order No. 7922312

The acoustic radiated pressure emanating from an infinite elastic plate excited by a unit impulse load for different observation angles and distances is obtained analytically. The solution is obtained by use of Fourier transform in time and Hankel transform on the radial coordinate. The inverse Fourier and Hankel transforms were evaluated using Cauchy contour integration theorem and regular and modified saddle point methods. The unit impulse response and convolution theorem was utilized to obtain an expression for radiated pressure of an infinite elastic plate excited by constant magnitude load, square pulse and continuous wave pulse loads. The acoustic pressure was shown to decay sinusoidally with an increasing period of oscillation. The decay rate for long times was shown to be the reciprocal of elapsed time.
Dissert. Abstr.

N79-33967*# Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
AN EXPERIMENTAL STUDY OF THE NOISE GENERATING MECHANISMS IN SUPERSONIC JETS Final Report, 15 Nov. 1977 - 31 Oct. 1979
Dennis K. McLaughlin 31 Oct. 1979 67 p refs
(Grant NsG-1467)
(NASA-CR-162343) Avail: NTIS HC A04/MF A01 CSCL 20A

Flow fluctuation measurements with normal and X-wire hot-wire probes and acoustic measurements with a traversing condenser microphone were carried out in small air jets in the Mach number range from M = 0.9 to 2.5. One of the most successful studies involved a moderate Reynolds number M = 2.1 jet. The large scale turbulence properties in the jet, and the noise radiation were characterized. A parallel study involved similar measurements on a low Reynolds number M = 0.9 jet. These measurements show that there are important differences in the noise generation process of the M = 0.9 jet in comparison with low supersonic Mach number (M = 1.4) jets. Problems encounted while performing X-wire measurements in low Reynolds number jets of M = 2.1 and 2.5, and in installing a vacuum pump are discussed. A.R.H.

N79-33968*# Lockheed-California Co., Burbank.
ANOPP VALIDATION STUDY: LOCKHEED L-1011
Larry Godby Hampton, Va. NASA 25 Oct. 1979 139 p
(Contract NAS1-15651)
(NASA-CR-159138; LR-29177) Avail: NTIS HC A07/MF A01 CSCL 20A

The aircraft noise prediction program (ANOPP) was used to predict the far-field noise characteristics of an L-1011 aircraft equipped with RB.211-524B engines. Actual flight noise was compared with noise predicted for the same operating and weather conditions. Correlation of predicted and measured results was very good in the aft quadrant of radiated noise. Predicted noise levels were significantly different from measured values in the forward quadrant because fan noise was predicted high. Since the major noise sources were fan and core, corrections are supplied to adjust ANOPP fan and core noise components so that the total predicted noise matches the measured L-1011 noise levels. A.R.H.

N79-33969# Christopher Newport Coll., Newport News, Va. Physics and Engineering.
AN APPLICATION OF CATASTROPHE THEORY TO EDGE-TONE PHENOMENA
A. M. Buoncristiani and G. R. Webb Mar. 1979 93 p refs
(Grant NsG-1429)
(NASA-CR-159102) Avail: NTIS HC A05/MF A01 CSCL 20A

The edge-tone exhibits discontinuities and hysteresis in frequency when the controls, the speed of the jet and the distance of the edge from the orifice of the jet, vary smoothly. Such discontinuous behaviors lend themselves to modeling by elementary catastrophes with superimposed structure. This augmented theory, when focused on the discontinuities and hysteresis, yields a global model for both the discontinuous and smooth functioning of the tone. The model displays explicitly the dependence on the two control variables, and appears as an ordinary differential equation that governs the variation in the amplitude of the tone. The data of Karamcheti and his coworkers define mode-control lines in the control plane. These lines suffice to fix all of the characteristics of the model but one. The two-tone model that is formed is qualitatively similar in behavior to the edge-tone and can serve as a tool for the practicing engineer who wishes to predict the significant events for the tone. Author

N79-33970# American Univ., Washington, D. C.
ROUGH SURFACE ACOUSTIC SCATTERING AND SCATTERING OF ACOUSTIC WAVES FROM ROUGH SURFACES Final Report
Susan K. Numrich and Earl Callen 2 Apr. 1979 21 p refs
(Contract N00014-77-C-0142; RR0320501)
(AD-A070630) Avail: NTIS HC A02/MF A01 CSCL 20/1

Measurements have been made of sound scattered in the specular direction by fixed rough surfaces. The surfaces used were physical realizations of computer generated topographies which corresponded to Gaussian distributions in height to within specified limits. Measurements were made in water using 0.5-, 1.0-, and 2.25-MHz transducers. Transient pulse analysis techniques were used to provide information about the scattered pulse over a wide range of frequencies. Comparisons are made with several theoretical models including a multiple scattering model. The scattered field is also illustrated by means of schlieren visualization. GRA

N79-33971# National Technical Information Service, Springfield, Va.
ACOUSTIC HOLOGRAPHY. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jun. 1979
William E. Reed Jul. 1979 303 p Supersedes NTIS/PS-78/0701; NTIS/PS-77/0579; and NTIS/PS-76/0441
(NTIS/PS-79/0736; NTIS/PS-78/0701; NTIS/PS-77/0579; NTIS/PS-76/0441) Avail: NTIS HC $28.00/MF $28.00 CSCL 20A

Worldwide research on acoustic holography is covered. Theory uses, equipment design, and imaging techniques are presented. Most of the studies are general and not applied to a specific use of acoustic holography. However, there are citations which do discuss its use in medicine, nuclear reactors, and nondestructive testing. This updated bibliography contains 294 abstracts, 51 of which are new entries to the previous edition. GRA

N79-33972# National Technical Information Service, Springfield, Va.
ACOUSTIC HOLOGRAPHY. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Jun. 1979
William E. Reed Jul. 1979 160 p Supersedes NTIS/PS-78/0700;NTIS/PS-77/0578; NTIS/PS-76/0440; NTIS/PS-75/432; and COM-74-10871
(NTIS/PS-79/0735/5; NTIS/PS-78/0700; NTIS/PS-77/0578; NTIS/PS-76/0440; NTIS/PS-75/432; COM-74-10871) Avail: NTIS HC $28.00/MF $28.00 CSCL 20A

Aspects of acoustic holography are covered in this bibliography of Federally-funded research. Theory equipment design, uses, and imaging techniques are presented. The applications include underwater and underground object locating, structural geology and tectonics, sonar imaging, non-destructive testing, antenna radiation patterns, nuclear reactor inspection, remote sensing, and use in medical examinations. This updated bibliography contains 151 abstracts, 9 of which are new entries to the previous editions. GRA

N79-33973# National Technical Information Service, Springfield, Va.
USE OF ULTRASONICS IN MANUFACTURING PROCEDURES. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - May 1979
Guy E. Habercom, Jr. Jul. 1979 180 p Supersedes NTIS/PS-78/0483; NTIS/PS-77/0450; NTIS/PS-76/0417; and NTIS/PS-75/244
(NTIS/PS-79/0638/1; NTIS/PS-78/0483; NTIS/PS-77/0450; NTIS/PS-76/0417; NTIS/PS-75/244) Avail: NTIS HC $28.00/MF $28.00 CSCL 13H

Ultrasonic fabrication techniques and tools are investigated in these Government sponsored research reports. Ultrasonic welding, heating, compacting, and cleaning are among the

methods reviewed. One hundred and seventy four abstracts are included. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N79-33974 North Texas State Univ., Denton.
LINE WIDTH PARAMETERS AND CENTER FREQUENCY SHIFTS IN THE ROTATIONAL SPECTRUM OF METHYL CYANIDE Ph.D. Thesis
David Lloyd Swindle 1979 106 p
Avail: Univ. Microfilms Order No. 7919752

Measurement of the line width parameters of a molecule is of interest because collision diameters can be calculated from them. This gives an effective size of the molecule when it is involved in interactions with other molecules. Further, specific types of interactions can be inferred from detailed information about the dependence of the line width upon pressure. An experiment for measuring line width parameters for methyl cyanide is described and the results of the experiment are analyzed. Dissert. Abstr.

N79-33975 Rice Univ., Houston, Tex.
TIME RESOLVED SPECTROSCOPY OF KRYPTON AND XENON MOLECULES EXCITED BY ELECTRON IMPACT AND BY MONOCHROMATIC SYNCHROTRON RADIATION Ph.D. Thesis
Thomas Dyer Bonifield 1979 160 p
Avail: Univ. Microfilms Order No. 7919564

The dependence of the fluorescence from molecular states of krypton and xenon measured following pulsed excitation of dense pure gas samples or binary gas mixtures by a low intensity beam of high energy electrons or by monochromatized vacuum ultraviolet (VUV) synchrotron radiation. The selectivity of the initial states excited by monochromatic photons is a significant advantage over electron beam excitation for the determination of radiative lifetimes and rates for reactions involving the lowest 1(u) and O(u)+ states of krypton and xenon. Electron beam excitation remains valuable for study of excited states which cannot be reached by photoexcitation, particularly the ionic states of the rare gases. Dissert. Abstr.

N79-33976 California Inst. of Tech., Pasadena.
AB INITIO CALCULATIONS OF PROCESSES IN LOW-ENERGY ELECTRON-MOLECULE SCATTERING Ph.D. Thesis
Deborah Ann Levin 1979 235 p
Avail: Univ. Microfilms Order No. 7919862

Topics covered include (1) Low energy e-N2 scattering cross sections in the static-exchange approximation; (2) rotational and vibrational-rotational excitation of H2 by electron impact in the static-exchange approximation; (3) the analytic evaluation of Gaussian matrix elements of the free particle Green's function; and (4) a method for obtaining scattering wave functions at arbitrary energies. The method is applied to some model potentials and to s-wave scattering for helium in the static-exchange approximation. Dissert. Abstr.

N79-33977 Wayne State Univ., Detroit, Mich.
PHOTOPHYSICAL PROPERTIES OF MOLECULAR EXCIMERS Ph.D. Thesis
Profulla Chandra Subudhi 1979 67 p
Avail: Univ. Microfilms Order No. 7921732

The molecules 1,1-bis (1-naphthyl) alkanes (n = 1 - 4) are studied. In these molecules the formation of a stable triplet excimer is confirmed by triplet - triplet absorption. The room temperature phosphorescence, which is nearly identical to that of the excimer phosphorescence of naphthalene, in fluid medium is excimer like. Thus proving that the geometry of the triplet excimer is distinctly different from that of singlet excimer. Triplet-triplet interaction in fluid solutions leads to the appearance of delayed fluorescence with two different life times. The short-lived component is due to the triplet-triplet annihilation of monomers, while the long-lived component is attributed to the interaction of two triplet excimers. The observation of delayed fluorescence eith a lifetime half that of the excimer phosphorescence or triplet-triplet absorption further confirms the existence of triplet excimers. Dissert. Abstr.

N79-33978 Villanova Univ., Pa.
A QUANTUM CHEMICAL STUDY OF THE UTILITY OF PROPERTY-OPTIMIZED GAUSSIAN EXPANSIONS Ph.D. Thesis
Sirirat Ho-Ampawanwong 1979 184 p
Avail: Univ. Microfilms Order No. 7919767

A modification of a Slater type orbital to includes a logarithmic term which is described. Because of the singularity in the Hamiltonian at $r = 0$, an eigenfunction of the Hamiltonian also has the singularity at $r = 0$. A logarithmic term was used in the Slater-type orbital for this purpose. The energies of the first excited state of the hydrogen atom, and of the ground state and the first excited state of the helium atom were calculated. Only the singlet excited state of the helium atom showed an appreciable improvement. The expectation values of one and two electron operators were calculated. Property optimized Gaussian expansions of Slater type orbitals were used to calculate the ground state energy and the one electron molecular properties of the water molecule and the NH2(-) species. The effect of simultaneously using a weighting factor and pseudonormalization was studied. Dissert. Abstr.

N79-33979 Texas Univ. at Austin.
THE EVALUATION OF COMPLETELY GENERAL QUADRATIC FORCE FIELDS USING THEORY AND EXPERIMEN DATA Ph.D. Thesis
Thomas Harley Arnold 1979 183 p
Avail: Univ. Microfilms Order No. 7920079

A semiempirical method was developed to calculate completely general quadratic potential functions using a combination of molecular orbital calculations and limited vibrational data. In the molecular orbital constraint using interaction coordinates (MOSCIC) method symmetry interaction displacement coordinates are constrained in nonlinear least squares determination of quadratic compliance constants. The only experimental data required in the MOCIC method are the frequencies of one isotopic species. The MOSCIC method is demonstrated. All of the experimental data (the fundamental frequencies, isotopic frequency shifts, Coriolis coupling constrants, mean squared amplitudes of vibration, and centrifugal distortion constants) can be used in a fitting procedure where both primary and interaction compliants are refined. Dissert. Abstr.

N79-33980 Princeton Univ., N. J.
EXPONENTIAL APPROXIMATIONS FOR MOLECULAR COLLISIONS Ph.D. Thesis
Susan Mary Tarr 1979 277 p
Avail: Univ. Microfilms Order No. 7919782

An exponential distorted were (EDW) program, which calculates inelastic molecular cross sections for vibrational-rotational energy transfer processes, was developed, tested, and applied to several molecular systems. A simple, inexpensive program, employed for the qualitative evaluation of total inelastic cross sections, combines the exponential Born approximation with an effective potential and represents the simplest in a hierarchy of approximations which employ exponential dynamical forms in conjunction with effective Hamiltonians. The vibrational-rotational relaxation of the He-H2 system, the He-HD system, and HCl-Ar are examined as well as the general features of rotationally inelastic atom-symmetric top collision systems. Dissert. Abstr.

N79-33981 Texas A&M Univ., College Station.
AN ELECTRON PARAMAGNETIC RESONANCE STUDY OF FLAVIN ANION RADICALS Ph.D. Thesis
James Curtis Winters 1979 165 p
Avail: Univ. Microfilms Order No. 7919118

The electron paramagnetic resonance spectra of lumiflavin (LF), flavin mononucleotide (FMN), and riboflavin (RF) anion radicals in alkaline aqueous solutions of sucrose, dextrose hydrate, and glycerol were recorded. Rotational correlation times of the radicals were established through computer simulations of the experimental spectra. It is found that flavin radicals undergo

strongly anisotropic motions in solution. Analysis of the dependences of the rotational correlation time and the residual linewidths of the flavin spectra indicate that all three flavins form molecular aggregates with the solutes in order of increasing strength: glycerol < sucrose < dextrose. The nature of the flavin solute interaction is dependent upon the solute rather than the flavin. The electron paramagnetic resonance spectra of 8-hydroxyriboflavin, 8-formylriboflavin, and 8-carboxyriboflavin anion radicals are presented. It is proposed that the observed linewidth effects are due to a mechanism such as exchange narrowing. Dissert. Abstr.

N79-33982 Arkansas Univ., Little Rock.
APPLICATIONS OF GLAUBER APPROXIMATION TO CHARGED-PARTICLE-NEUTRAL-ATOM COLLISIONS Ph.D. Thesis
Cheng-Hui Chang 1978 115 p
Avail: Univ. Microfilms Order No. 7919273

The Glauber amplitude for charged particle neutral atom collision reduced to a one dimensional integral representation involving modified Lommel functions, is used to study atomic collision problems. The individual n = 3 cross sections of atomic hydrogen be electron impact and the Balmer - alpha cross section predicted by the Glauber theory in the range 18 less than or equal to E sub i less than or equal to 500 eV are compared experiments and with other polarization fractions of 3p-2s, 3d-2p, and of the Balmer - alpha line are also calculated in the Glauber approximation, and comparison is made with the existing experimental data and with the Born predictions. The collision parameters (lambda, C41) prediction by the Glauber approximation are also given. Dissert Abstr.

N79-33983 Illinois Univ. at Chicago Circle, Chicago.
DETERMINATION OF INTERMOLECULAR POTENTIALS FROM ION-MOLECULE SCATTERING EXPERIMENTS Ph.D. Thesis
Penelope Marie Polak-Dingels 1979 188 p
Avail: Univ. Microfilms Order No. 7923026

Incomplete total cross sections were measured for Li(+) scattered by He, Ne, Ar, Kr, Xe, N2, CO, H2, D2 and CH3I. Computed cross sections were compared to the experimental results for the rare gases and the best fit potentials were determined. A numerical spline method was developed to calculate cross sections from potential data and to compare the results with other potentials for the Li(+) rare gas systems. Differential cross sections were measured for K(+) scattered by CsCl in a crossed beam experiment. These data were analyzed in the content of classical perturbation scattering theory and show that the scattering is dominated by the ion dipole interaction. Dissert. Abstr.

N79-33984 Colorado State Univ., Fort Collins.
PHYSICAL PROCESSES IN DIRECTED ION BEAM SPUTTERING Ph.D. Thesis
Raymond Steven Robinson 1979 156 p
Avail: Univ. Microfilms Order No. 7923373

A model for the magnetic containment of both primary and secondary or Maxwellian electrons in the discharge plasma was developed. Calculations of cross sections for energy and momentum transfer in binary collisions between like pairs of Ar, Kr, and Xe atoms in the energy range from about 1 eV to 1000 eV were made from available pair interaction potentials using a classical model. Experimental data from the literature was fit to a theoretical expression for the Ar resonance charge exchange cross section over the same energy range. A model was developed that describes the processes of conical texturing of a surface due to simultaneous directed ion beam etching and sputter deposition of an impurity material. It was predicted from the model, and subsequently, verified experimentally, that a high sputter yield material could serve as a seed for coning of a lower sputter yield substrate. Dissert. Abstr.

N79-33985 California Univ., San Diego.
AN INVESTIGATION OF THE TWO-PHOTON REACTION IN ELECTRON-POSITRON COLLIDING BEAMS Ph.D. Thesis
Michael Kenneth Sullivan 1979 155 p
Avail: Univ. Microfilms Order No. 7921500

The 2 photon process was studied with beam energies of 3.0 and 3.6 GeV. In all events both the electron and positron that produced the event were detected. Hexagonal NaI crystals were used to measure the energy of the electron and positron. A charged track detector with 93% solid angle coverage observed a total of 20 events with 2 charged particles near the mass of the f(1270) and the eta nison prime. The conclusions reached were that the 2 photon width of the f is 7.0 + or - 2.1 keV, and that the data is not inconsistent with the predicted 2 photon width of 6.3 keV for the eta nison prime. In addition, 25 pion events and 25 muon events were detected in a smaller region of solid angle, allowing the calculation of the ratio of pion events to muon events (R sub 2 photon). The value of R sub 2 photon obtained was 1.0 + or - 0.34. This value is in closer agreement with the prediction of the fractionally charged quark model than with the prediction of the integrally charged quark model. Dissert. Abstr.

N79-33986*# California Inst. of Tech., Pasadena. W. K. Kellogg Radiation Lab.
ENERGY DEPENDENCE OF THE TRAPPING OF URANIUM ATOMS BY ALUMINUM OXIDE SURFACES
K. G. Librecht Oct. 1979 12 p refs
(Grants NGR-05-002-633; NSF PHYS-76-83685; EX-76-G-03-1305)
(NASA-CR-162362; BAP-18) Avail: NTIS HC A02/MF A01 CSCL 20H

The energy dependence of the trapping probability for sputtered U-235 atoms striking an oxidized aluminum collector surface at engeries between 1 eV and 184 eV was measured. At the lowest energies, approximately 10% of the uranium atoms are not trapped, while above 10 eV essentially all of them stick. Trapping probabilities averaged over the sputtered energy distribution for uranium incident on gold and mica are also presented. A.R.H.

N79-33987# California Univ., Riverside.
CALCULATION OF ELECTRON-CARBON MONOXIDE VIBRATIONAL TRANSITION CROSS SECTIONS Final Technical Report, 15 Apr. 1977 - 15 Jan. 1979
Robert T. Poe and B. H. Choi Apr. 1979 127 p refs
(AF Proj. 2301; Contract F33615-77-C-2011)
(AD-A071596; AFAPL-TR-79-2022) Avail: NTIS HC A07/MF A01 CSCL 20/8

Critical evaluations of theories used for electron-molecule scattering calculation were made. The hybrid theory appears to be best suited for the calculation of e-CO vibrational transition cross sections. A reformulation of hybrid theory was made in terms of the total angular momentum representation. The vibrational transition cross sections of e-CO scattering were computed in the energy range of 0-10 eV, based on this reformulation. The agreement between the results of present calculation and the experimental measurements for 0-v vibrational transitions were reasonably good. Furthermore, the present calculations predicted the strong resonance peak at 1.4 eV in the 1-2 vibrational transition cross section. In general, the rate of vibrational excitations decreases as the change of vibrational quantum numbers increases. GRA

N79-33988# Addis Translations International, Portola Valley, Calif.
SHELL EFFECTS IN THE EQUATION OF STATE OF A COLD, HIGHLY COMPRESSED SUBSTANCE
G. V. Shpatakovskaya Mar. 1979 35 p refs Transl. into ENGLISH of "Obolochechnye effekty v uravnenii sostoyaniya kholodnogo silnoszhatogo veshchestva", Preprint no. 54, Inst. Appl. Math., Acad. Sci. USSR, 1975 45 p Sponsored by DOE (UCRL-Trans-11472) Avail: NTIS HC A03/MF A01

The generalized Thomas-Fermi model, allowing the description of shell effects in an atom, is applied to calculation of the energy and equation of state of a compressed solid at zero temperature and a pressure of P much > e/sup z//a sub o/sup y/ approximately or = 300 mbar. The shell effects at these levels of compression result in phase transition of the first kind. The characteristics of these phase transitions are calculated for various elements. It is shown that the corresponding jumps in density are quite great, which may be significant for astrophysical applications. The variation in atomic volume of an element with its atomic number at a fixed pressure is also calculated. DOE

N79-33989# Pittsburgh Univ., Pa. Dept. of Physics.
RAYLEIGH SCATTERING AMPLITUDES FOR NEON AND CARBON: THE 100 eV TO 30 keV
J. C. Parker and R. H. Pratt 1 May 1979 39 p refs
(Contract W-7405-eng-48)
(UCRL-13993) Avail: NTIS HC A03/MF A01

A tabulation is presented for the amplitudes and differential cross sections for Rayleigh scattering from neon and carbon in the energy range from 100 eV to 30 keV, at 5 deg intervals. At these energies Rayleigh scattering gives the only significant contribution to the total elastic scattering differential cross section for photon-atom scattering. The amplitudes and cross sections can be calculated to better than 1% for all energies between 0.1 keV and 10 MeV. Author (DOE)

N79-33990# Pittsburgh Univ., Pa. Dept. of Physics.
CALCULATING RAYLEIGH SCATTERING AMPLITUDES FROM 100 eV TO 10 MeV
J. C. Parker, G. W. Reynaud, D. J. Botto, and R. H. Pratt 1 May 1979 107 p refs
(Contract W-7405-eng-48)
(UCRL-13994) Avail: NTIS HC A06/MF A01

An attempt is made to explain how to calculate the contribution to elastic photon-atom scattering due to Rayleigh scattering (the scattering off bound electrons) in the photon energy range 100 eV < or = W < or = 10 MeV. All intermediate calculations are described, including the calculation of the potential, bound state wave functions, matrix elements, and final cross sections. DOE

N79-33991# California Univ., Berkeley. Lawrence Berkeley Lab.
CROSSED MOLECULAR BEAM STUDIES OF UNIMOLECULAR REACTION DYNAMICS Ph.D. Thesis
Richard James Buss Apr. 1979 165 p refs Sponsored in part by ONR
(Contract W-7405-eng-48)
(LBL-9057) Avail: NTIS HC A08/MF A01

The study of seven radical-molecule reactions using the crossed molecular beam technique with supersonic nozzle beams is reported. Product angular and velocity distributions were obtained and compared with statistical calculations in order to identify dynamical features of the reactions. In the reaction of chlorine and fluorine atoms with vinyl bromide, the product energy distributions are found to deviate from predictions of the statistical model. A similar effect is observed in the reaction of chlorine atoms with 1, 2 and 3-bromopropene. The reaction of oxygen atoms with IC1 and CF3I was used to obtain an improved value of the IO bond energy, 55.0 +- 2.0 kcal/mol. In all reactions studied, the product energy and angular distributions are found to be coupled, and this is attributed to a kinematic effect of the conservation of angular momentum. DOE

N79-33992# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF HIGH CURRENT LOW ENERGY H+ ION SOURCE Final Technical Report
A. T. Forrester, J. T. Crow, and D. M. Goebel 1978 20 p refs
(Contract W-7405-eng-48)
(UCRL-13962) Avail: NTIS HC A02/MF A01

An ion source suitable for double charge exchange of D(+) ions to D(-) ions in cesium or other vapor, is discussed. Since the fraction of the D(+) which changes to D(-) may be as high as 0.35 in the energy below one keV, the process appears very favorable, a source of several hundred sq cm area, is desired with a D(+) current density greater than, say 0.2A/sq cm. Small angular spread is essential with up to about 0.1 radian being acceptable. A simple approach to this problem appears to be through fine mesh extraction electrodes. In this system a single grid facing the ion source plasma constitutes the entire extraction electrode system. If the potential difference between the grid and the source plasma is large compared to the ion energy at the plasma boundary, then the distance is just the Child-Langmuir distance corresponding to the ion current density and the potential difference between the plasma and the grid. DOE

N79-33993# Brookhaven National Lab., Upton, N. Y.
CHARM PARTICLE PRODUCTION BY NEUTRINOS
N. P. Samios 1979 18 p Presented at the Orbis Scientiae 1979 Conf., Coral Gables, Fla., 15 Jan. 1979
(Contract EY-76-C-02-0016)
(BNL-26002; Conf-790150-2) Avail: NTIS HC A02/MF A01

Further evidence is discussed, and confirmation given of the existence of the Lambda/sub c/+ (2260) and Sigma/sub c/++ (2424) charm baryons, as well as the observation of the D++ (2000) charm meson, these states all being produced by neutrino interactions. The status of (negative mu positive e) di-lepton neutrino production in bubble chambers, especially as it affects charm production is reviewed. DOE

N79-33994# Oak Ridge National Lab., Tenn.
FATE OF ELECTRONS WITH ENERGIES LESS THAN 100 eV
J. A. D. Stockdale 1978 9 p refs Presented at the 6th Intern. Congr. Symp. on Radiation Res. and Stem Cells, Tokyo, 13 May 1979
(Contract W-7405-eng-26)
(CONF-790524-3) Avail: NTIS HC A02/MF A01

An introduction is given to some of the major processes which take place when low energy electrons collide with molecules. Temporary negative ion states, dissociative electron attachment, and vibrational and rotational excitation are emphasized. Resonances and some comments on H2O are also covered. DOE

N79-33995# Los Alamos Scientific Lab., N. Mex.
ATOMIC CAPTURE OF NEGATIVE MESONS IN HYDROGEN
M. Leon 1979 7 p refs Presented at the 2d course of the Intern. School of Physics of Exotic Atoms, Erice, Sicily, 26 Mar. - 6 Apr. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1235) Avail: NTIS HC A02/MF A01

The present state of theoretical understanding of atomic capture of negative mesons is assessed and a very simple model calculation of negative muon capture by the simplest atoms, hydrogen is described. The possibility of generalizing these results to more complicated atoms and even molecules is noted. DOE

N79-33996# California Univ., Berkeley. Lawrence Berkeley Lab.
SELECTED TOPICS ON THE ELECTRONIC STRUCTURE OF SMALL MOLECULES Ph.D. Thesis
W. C. Swope Apr. 1979 80 p refs
(LBL-9094) Avail: NTIS HC A05/MF A01

A systematic procedure is presented for constructing symmetrized functions of the coordinates of N fermion particles which may be used as trial wavefunctions in a quantum mechanical description of an N-electron molecular system. The functions are symmetrized with respect to the mathematical point group of operators which commute with the system's electronic Born-Oppenheimer Hamiltonian, as well as the permutation group. Also, a simple model is presented which provides insight into some of the electric and magnetic properties of small molcules. The probability distribution of the electrons in a molecule is approximated by that of a single particle moving in a three dimensional anisotropic harmonic oscillator potential. Within this approximation the molecular electric polarizability, the magnetic susceptibility, and the magnetic shielding of a nuclear spin due to current generated in the electron distribution by a magnetic field (the chemical shift) are computed using perturbation theory. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N79-33997# Oak Ridge National Lab., Tenn.
HEAVY-ION-INDUCED FISSION FOLLOWING FUSION

F. Plasil and R. L. Ferguson 1979 38 p refs Presented at the IAEA Symp. on Phys. and Chemistry of Fission, Julich, W. Ger., 14 May 1979
(Contract W-7405-eng-26)
(IAEA-SM-241-D1; Conf-790507-3) Avail: NTIS HC A03/MF A01

Theoretical considerations of fission of systems with high angular momenta are made in the framework of the rotating liquid drop model. The studies of excitation functions for evaporation residue products are discussed. The extent to which the vanishing fission barrier imposes a limit on evaporation residue cross sections is discussed. Excitation functions for both evaporation residue products and for well characterized fission fragments are studied to carry out a statistical model analysis and extract values of the fission barrier. It is concluded that liquid drop fission barriers must be reduced by approximately 40% to reproduce experimental results. DOE

N79-33998# Naval Postgraduate School, Monterey, Calif. Dept. of Physics and Chemistry.
NUCLEAR GIANT MULTIPOLE RESONANCES BY INELASTIC ELECTRON SCATTERING Final Report, 1 Nov. 1976 - 31 Jul. 1979
Fred R. Buskirk 29 May 1979 94 p Sponsored by NSF
(AD-A071929; NPS61-79-009) Avail: NTIS HC A05/MF A01 CSCL 20/8

Inelastic electron scattering experiments were performed with the Naval Postgraduate School 110 MeV Linac. The investigation included 238U, 140Ce, 89Y, 60Ni, 58Ni and 28Si, which combined with our previous studies of 208Pb, 197Au and 165Ho, form a survey of the giant resonances in many nuclei. The energy resolution of about 0.4% to 0.5%, was usually sufficient for studying these broad resonances; the excitation energy range covered was from 4 to 40 or 50 MeV, and showed giant resonances of energies from 6 to 33 MeV. Forward scattering angles were used resulting in only electric multipole resonances. The cerium experiment possibly revealed more than any other single nucleus studied. In addition to E2 Delta T -0 at 10 MeV and E1 at 15.3 MeV, the isovector E2 appears at 25 MeV. E3 resonances appear at 6.0 MeV, 22 MeV and 34638 MeV in general agreement with the model of Bohr and Mottelson. For Uranium, both quadrupole resonances were observed, but were low in strength unless a transition radius larger than the ground state radius was assumed. Systematics of the resonance at 53 cu.rt. (1/A) MeV showed a smooth and drastic decrease with strength as a function of decreasing A, a behavior not seen for the GQR at 63 cu.rt.(1/A) MeV. This suggests the former resonance is an oscillation of the excess neutron of a heavy nucleus. GRA

N79-33999# Maryland Univ., College Park. Dept. of Physics and Astronomy.
SELF-CONSISTENT THEORY OF CYCLOTRON MASER INSTABILITY FOR INTENSE HOLLOW ELECTRON BEAMS
H. Uhm , Ronald C. Davidson (Dept. of Energy, Washington, D. C.), and K. R. Chu (Naval Res. Lab.) 1978 47 p refs
(Contracts N00014-75-C-0309; N00014-67-C-0309)
(AD-A070610) Avail: NTIS HC A03/MF A01 CSCL 20/5

The analysis is carried out for the specific choice of equilibrium electron distribution function in which all electrons have the same value of canonical angular momentum and the same value of energy in a frame of reference moving with axial velocity c beta sub b. Stability properties are investigated including the important influence of finite radial geometry, finite beam temperature, and transverse magnetic perturbations (delta B not = 0). It is shown that instability exists for a very narrow range of axial wavenumbers satisfying abs. val. (k-(beta sub b)omega/C)--1/R sub 0. Detailed stability properties are calculated for a variety of system parameters. GRA

N79-34000# Alberta Univ., Edmonton. Dept. of Physics.
MESON RADIATIVE DECAYS
B. L. Edwards and A. N. Kamal (Stanford Univ., Calif.) Apr. 1979 14 p refs Presented at the Bangladesh Phys. Soc. Meeting, Decca, Bangladesh, 14 Jan. 1979
(Contract EY-76-C-03-0515)
(SLAC-PUB-2303; Conf-790151-1) Avail: NTIS HC A02/MF A01

The status of decays of the kind V yields P gamma and P yields V gamma is considered. The low experimental value of gamma (rho yields pi gamma) remains the outstanding problem. The lastest preliminary numbers from a Fermi Laboratory experiment go in the right direction but not far enough. DOE

N79-34001# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Physics.
STRONG CP INVARIANCE WITH NEW MASSLESS QUARKS
Lay Nam Chang, S. M. Barr (Penn. Univ., Philadelphia), and J. E. Kim (Penn. Univ., Philadelphia) 1978 11 p refs
(Contract EY-76-C-02-3071; Grant NSF 78-21975)
(UPR-0114T) Avail: NTIS HC A02/MF A01

New massless quarks Q1 and Q2 transforming nontrivially in an additional gauge group G are postulated to solve the strong CP problem naturally. DOE

N79-34002# California Univ., Berkeley. Lawrence Berkeley Lab.
NUCLEAR STRUCTURE FROM CONTINUUM GAMMA-RAYS
R. M. Diamond Mar. 1979 24 p refs Presented at the Symp. on High Spin Phenomena in Nuclei, Argonne, Ill., 15 Mar. 1979
(Contract W-7405-eng-48)
(LBL-8965; Conf-790323-4) Avail: NTIS HC A02/MF A01

The properties of states of spins of 20 to 60 are considered using the liquid drop model and some shell effects. The angular momenta at which the fission barrier becomes zero or 8 MeV as a function of mass number, moments of inertia, and rotational energies, and the various gamma spectra for some specific nuclei are plotted. DOE

N79-34003# Los Alamos Scientific Lab., N. Mex.
PHYSICS USES OF INTENSE PROTON BEAMS AT 10 TO 20 GeV
D. E. Nagle 1979 6 p refs Presented at 2d Intern. Conf. on Meson-Nucl. Phys., Houston, Tex., 5-9 Mar. 1979
(Contract W-7405-eng-36)
(LA-UR-79-898; Conf-790347-2) Avail: NTIS HC A02/MF A01

The physics experimental potential for beams of 10 to 20 GeV protons is discussed. Some specific research fields to utilize a kaon factory are: physics with polarized beams and polarized targets; pion scattering; exotic hadromic states; hypernuclear physics; kaonic atomic X-ray; nuclear scattering with kaons; nuclear spectroscopy with kaons; neutral kaon physics; rare decays of the kaon; antiproton physics; neutrino-electron scattering; and hadronic atoms. DOE

N79-34004# Department of Energy, Washington, D. C. Office of Energy Res.
HIGH ENERGY PHYSICS. ULTIMATE STRUCTURE OF MATTER AND ENERGY
Apr. 1979 42 p
(DOE/ER-0027) Avail: NTIS HC A03/MF A01

It is shown how one layer after another was discovered by penetrating farther into the structure of matter. The mounting energy scale, discoveries at high energy frontier, the families of quarks and leptons, the four forces of nature, some achievements of the past few years, particle accelerators, and experimental apparatus are covered. DOE

N79-34005# California Univ., Livermore. Lawrence Livermore Lab.
PRODUCTION OF HIGH ENERGY NEUTRINOS IN RELATIVISTIC SUPERNOVA SHOCK WAVES
T. A. Weaver Jan. 1979 12 p refs Presented at the 1978 DUMAND Summer Workshop, San Diego, Calif., 11 Aug. 1978
(Contract W-7405-eng-48)
(UCRL-82152; Conf-7808107-1) Avail: NTIS HC A02/MF A01

The possibility of producing high-energy neutrinos (>approximately 10 GeV) in relativistic supernova shock waves is

considered. It is shown that, even if the dissipation in such shocks is due to hard hadron-hadron collisions, the resulting flux of neutrinos is too small to be observed by currently envisioned detectors. The associated burst of hard gamma-rays, however, may be detectable. DOE

N79-34006# General Accounting Office, Washington, D. C. Div. of Energy and Minerals.
FEDERAL FACILITIES FOR STORING SPENT NUCLEAR FUEL; ARE THEY NEEDED
27 Jun. 1979 42 p
(PB-297071/3; EMD-79-82) Avail: NTIS HC A03/MF A01 CSCL 18G

The question of whether commercial spent fuel is processed and how and where spent fuel is permanently stored is considered. GRA

N79-34007# American National Standards Inst., New York.
AMERICAN NATIONAL STANDARD N43.1 RADIOLOGICAL SAFETY IN THE DESIGN AND OPERATION OF PARTICLE ACCELERATORS Final Report
E. H. Eisenhower May 1979 28 p refs Revised Sponsored by Natl. Bureau of Standards, Wash., D.C.
(PB-296235/5; ANSI-N43.1-1978-Rev; NBS/HB-107-Rev) Avail: NTIS HC A03/MF A01 CSCL 20G

The characteristics of and controls for radiations as they affect accelerator design, operating procedures, and exposure evaluation are considered. Radiation shielding considerations and the use of safety systems are included. Operational health physics requirements are treated extensively, and radiation measurements are discussed in terms of the types of radiation that may be produced and proper techniques for monitoring. The basic exposure considerations such as maximum permissible dose and dose equivalent are noted. GRA

N79-34008# Office of Radiation Programs, Washington, D. C.
LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT: PROCEEDINGS OF HEALTH PHYSICS SOCIETY MIDYEAR TOPICAL SYMPOSIUM
May 1979 551 p refs Symp. held at Williamsburg, Va., 11-15 Feb. 1978 Sponsored by EPA
(PB-296947/5; EPA-520/3-79-002) Avail: NTIS HC A24/MF A01 CSCL 18G

Low level radioactive waste management activities and regulations are highlighted. The public health and safety and environmental impact potential of the radioactive waste associated with the nuclear industry is discussed along with the origin, handling and transportation, and disposal operations and alternatives for radioactive waste disposal. A.W.H.

74 OPTICS

Includes light phenomena.

N79-34009 Carnegie-Mellon Univ., Pittsburgh, Pa.
GUIDED-WAVE ELECTROOPTIC DEVICES AND APPLICATIONS Ph.D. Thesis
Paul Saunier 1979 170 p
Avail: Univ. Microfilms Order No. 7919155

The fabrication techniques of optical waveguides in LiNbO3 are described. The characteristics of the electro-optic effect are given. The speed capability of electro-optical interaction type devices is emphasized and the capacitance of the most commonly used electrode structure, two parallel conducting strips, is calculated. An electro-optic device using simulated prism structure electrodes capable of providing substantially more than two beam positions is evaluated. A phased array channel waveguide deflector is discussed which offers the following properties: the linearity of the deflected angle as a function of the applied voltage is maintained over a wide range of voltages, the modulation of the light intensity is a periodic function of the applied voltage, and the optical beam quality is preserved during deflection. Dissert. Abstr.

N79-34010 Cincinnati Univ., Ohio.
CODED FLUORESCENT X-RAY SOURCES Ph.D. Thesis
Michael Dennis Harpen 1979 146 p
Avail: Univ. Microfilms Order No. 7922599

An off axis Fresnel zone plate was constructed of plexiglass and barium oxide (an X-ray fluorescent material) and fitted into the nozzle of a conventional diagnostic X-ray machine. The focusing properties of Fresnel zone plates allowed the restoration of the resolution by viewing the photographically reduced radiographs in coherent light, a process similar to viewing the real image of a hologram. A zone plate with alternate zones of cerium oxide and barium oxide was constructed and fitted into the conventional machine. The fluorescent source was used to image a phantom containing iodine with an absorption edge at an energy between the energies of the fluorescent X-rays of barium and cerium. These radiographs were viewed in coherent light and a contrast subtracted image was obtained in which only the iodine was seen. Dissert. Abstr.

N79-34011* National Aeronautics and Space Administration. Pasadena Office, Calif.
MULTI-CHANNEL ROTATING OPTICAL INTERFACE FOR DATA TRANSMISSION Patent
Charles V. Ivie, inventor (to NASA) (JPL) Issued 4 Sep. 1979 6 p Filed 25 Aug. 1977 Supersedes N79-20496 (17 - 11 p 1447)
(NASA-Case-NPO-14066-1; US-Patent-4,166,959; US-Patent-Appl-SN-827464; US-Patent-Class-250-551; US-Patent-Class-250-216) Avail: US Patent and Trademark Office CSCL 20F

Apparatus for transmitting multiple channels of data across a rotating interface, such as between an antenna that rotates with respect to a platform, is described. Features of the apparatus include: (1) light emitter elements and light detector elements located on the two bodies that rotate relative to each other; (2) a lens for focusing light from each emitter element onto a corresponding detector element; and (3) an image rotating means which is turned as one of the objects rotates, to derotate the images of the emitter elements that are to be focused on the detector elements.
Official Gazette of the U.S. Patent and Trademark Office

N79-34012 California Inst. of Tech., Pasadena.
PHASE CONJUGATE OPTICS AND NONLINEAR OPTICAL PHENOMENA IN OPTICAL FIBERS Ph.D. Thesis
John Chen-Wei AuYeung 1979 148 p
Avail: Univ. Microfilms Order No. 7922042

The use of nonlinear optical mixing techniques to generate the complex conjugate of an arbitrary incident monochromatic wave is discussed. The theory of the degenerate four wave mixing technique is presented. The phase conjugate wave front generation in a liquid crystal material is described. The ability of the conjugate wave front to correct for phase aberration is demonstrated. The quantum mechanical origin of the nonlinear third order susceptibility responsible for the four wave mixing process is illustrated in an atomic system. The applications of the phase conjugation process to real time information processing and the characteristics of a phase conjugate resonator are discussed. Dissert. Abstr.

N79-34013*# National Aeronautics and Space Administration. Pasadena Office, Calif.
PRECISE RF TIMING SIGNAL DISTRIBUTION TO REMOTE STATIONS Patent Application
George F. Lutes, Jr., inventor (to NASA) (JPL) Filed 24 Aug. 1979 8 p
(Contract NAS7-100)
(NASA-Case-NPO-14749-1; US-Patent-Appl-SN-078521) Avail: NTIS HC A02/MF A01 CSCL 20F

An improved and simplified distribution system is provided for a precise RF reference signal, such as a signal from an H-maser using a light beam from a laser as a frequency carrier, modulating the light beam with the RF timing signal in a modulator, and after distribution to remote stations through optical fibers, demodulating the carrier with an optical detector to detect the RF timing signal. The detected RF reference signal is then processed through an RF detector to provide an automatic gain control (AGC) signal that has an average value proportional to the amplitude of the RF reference signal. This AGC signal is applied to a voltage variable attenuator positioned in front of the RF detector. Since the light frequency is very high, as compared

to the RF reference signal, deviation of the reference signal phase is a very small fraction of the RF frequency. In that manner, the timing signal amplitude is maintained constant at each station with substantially zero phase stability degradation. NASA

N79-34014*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MICROWAVE LIMB SOUNDER Patent Application
Jacob J. Gustincic, inventor (to NASA) (Gustincic (J. J.) Consulting Engineer, Marina Del Rey, Calif.) Filed 24 Sep. 1979 21 p
(Contract JPL-954492)
(NASA-Case-NPO-14544-1; NASA-Case-NPO-14545-1; NASA-Case-NPO-14546-1; NASA-Case-NPO-14547-1; US-Patent-Appl-SN-078612) Avail: NTIS HC A02/MF A01 CSCL 20F

A microwave limb sounder (MLS) to measure trace gases in the upper atmosphere by comparing spectral noise content of limb soundings with the spectral noise content of cold space is disclosed. In sounder utilizes an offset Cassegrain antenna system and a tiltable input mirror to alternately look out at the limb and up at cold space at an elevation angle of about 22 deg. Reflection from the mirror is directed into a radiometer which functions as a diplexer to combine the input radiation and a local oscillator (klystron) beam. The radiometer head is comprised of a Fabry-Perot resonator consisting of two Fabry-Perot cavities spaced a number of half wavelengths apart. Incoming radiation received on one side is reflected and rotated 90 deg in polarization by the resonator so that it will be reflected by an input grid into a mixer, while the klystron beam received on the other side is also reflected and rotated 90 deg. NASA

N79-34015*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ULTRAVIOLET ABSORPTION OF COMMON SPACECRAFT CONTAMINANTS
Joe A. Colony Aug. 1979 28 p refs
(NASA-TM-80551) Avail: NTIS HC A03/MF A01 CSCL 20F

Organic contamination of ultraviolet optical systems is discussed. Degradation of signal by reflection, scattering, interference, and absorption is shown. The first three processes depend on the physical state of the contaminant while absorption depends on its chemical structure. The latter phenomenon is isolated from the others by dissolving contaminants in cyclohexane and determining absorption spectra from 2100A to 3600A. A variety of materials representing the types of contaminants responsible for most spaceflight hardware problems is scanned and the spectra is presented. The effect of thickness is demonstrated for the most common contaminant, di(2 ethyl hexyl)phthalate, by scanning successive dilutions. A.W.H.

N79-34016*# National Aeronautics and Space Administration, Washington, D. C.
ELECTROOPTICAL MODEL OF THE FIRST RETINA LAYERS OF A VISUAL ANALYZER
Yu. L. Chibalashvili, A. D. Riabinin, S. V. Svechnikov, Yu. L. Chibalashvili, and A. M. Shkvar Sep. 1979 14 p refs Transl. into ENGLISH from Poluprov. Tekh. Mikroelektron. (USSR), no. 8, 1972 p 15-21 Original language document published as A73-13657 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75509) Avail: NTIS HC A02/MF A01 CSCL 20F

An electrooptical principle of converting and transmitting optical signals is proposed and used as the basis for constructing a model of the upper layers of the retina of the visual analyzer of animals. An evaluation of multichannel fibrous optical systems, in which the conversion of optical signals is based on the electrooptical principle, to model the upper retina layers is presented. The symbolic circuit of the model and its algorithm are discussed. A.W.H.

N79-34017*# National Aeronautics and Space Administration, Washington, D. C.
A PROCEDURE FOR DETERMINING THE OPTICAL CHARACTERISTICS OF A DEVICE FOR MEASURING ILLUMINATION IN THE ATMOSPHERE OF VENUS
Yu. M. Golovin and B. Ye. Moshkin Oct. 1979 22 p refs Transl. into ENGLISH of Metodika Opredeleniya Opticheskikh Kharakt Ristik Pribora plya Izmereniya Sveshchennosti v Atmosfere Venere (Moscow), Report Pr-341, 1977 21 p Transl. by Scientific Translation Service, Santa Barbara, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3198)
(NASA-TM-75712) Avail: NTIS HC A02/MF A01 CSCL 20F

A procedure is described for obtaining the calibration, angular and spectral characteristics of a broad band photometer used on Venera 9 and 10 spacecraft to measure the illuminance regime in five spectral intervals with respect to three directions. The photometer has three identical groups of photoreceivers on which light falls through fiber light guides. Each group contains three cadmium sulfide photoresistors with light filters, a cadmium selenide photoresistor and a silicon photodiode. The temperature of the photoreceivers is measured by thermistors installed in series with the receivers. A.R.H.

N79-34018# Army Aeromedical Research Lab., Fort Rucker, Ala.
A HUMAN PERFORMANCE/WORKLOAD EVALUATION OF THE AN/PVS-5 BIOFOCAL NIGHT VISION GOGGLE Final Report
L. W. Stone, M. G. Sanders, D. D. Glick, R. Kim Wiley, and K. A. Ball Jul. 1979 97 p refs
(DA Proj. 3E7-62173-A-819)
(AD-A071882; USAARL-79-11) Avail: NTIS HC A05/MF A01 CSCL 06/17

Eight experienced US Army aviators performed various maneuvers in an instrumented helicopter to test the relative usability of two bifocally configured night vision goggles. Both configurations were statistically better than the unmodified arrangement when looking at a pilot's ability to hold a precise altitude at night. The subjective data, supported by flight performance observed betweeen the two bifocals, further suggested that a 24% bifocal version was more desirable than a 14% configuration. The inference is that the reduced inside field-of-view presented by the 14% bifocal interferes with a pilot's ability to rapidly locate instruments once he has directed his attention inside the cockpit. GRA

N79-34019# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
ATTENUATION MEASUREMENTS ON OPTICAL FIBER WAVEGUIDES: AN INTERLABORATORY COMPARISON AMONG MANUFACTURERS
G. W. Day and G. E. Chamberlain May 1979 36 p
(PB-296951/7) Avail: NTIS HC A03/MF A01 CSCL 20F

Seven manufacturers of optical fiber waveguides participated in an interlaboratory comparison of attenuation measurements. Four different measurements were performed on each of two fibers. The range of results was typically 1 to 1.5 dB/km for fibers with 3 to 7 dB/km nominal attenuation. The results and an analysis based on additional data taken by NBS are reported. GRA

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N79-34020 Maryland Univ., College Park.
DYNAMICS AND CONSEQUENCES OF RUNAWAY ELECTRONS IN TOKAMAK PLASMAS Ph.D. Thesis
Yung Mok 1978 152 p
Avail: Univ. Microfilms Order No. 7920724

The electron distribution function in Tokamak plasmas is investigated using the Fokker-Planck equation. The original Fokker-Planck equation is modified to take into account particle loss so that the distribution function is normalizable when boundary conditions are imposed. A different approach is used to determine the normalization in order to avoid using the ambiguous part of the distribution that was crudely approximated. A slow-varying

(in time) distribution as well as a steady one is found. The distribution is analyzed for stability against the magnetized plasma waves driven by the amomolous Doppler resonances. The experimental conditions of a Tokamak correspond to a set of points in the same parameter space, so that the stability of the plasma is determined by the position of the Tokamak's operation point. The effects of different temperature and density profiles are discussed. Dissert. Abstr.

N79-34021 Texas Univ. at Austin.
NUMERICAL SOLUTION OF THE DRIFT KINETIC EQUATION Ph.D. Thesis
John Francis Santarius 1979 93 p
Avail: Univ. Microfilms Order No. 7920201

The nonadiabatic part of the electron distribution in toroidal geometry is investigated through numerical solution of the drift kinetic equation in various parameter regions. A Lorentz operator is used to model collisions for both trapped and untrapped electrons, thus including angle scattering for all of velocity space. Both poloidal and pitch angle dependence of the electron magnetic curvature and gradient drifts are included without the necessity of bounce averaging. No special boundary conditions are used at the trapped-untrapped electron boundary. A preconditioned conjugate gradient is used to solve the drift kinetic equation. The result is used in a dispersion relation which includes ion inertia and ion Landau damping to find growth rates for the dissipative trapped electron mode in the radially local case.
Dissert. Abstr.

N79-34022 California Univ., Irvine.
HIGH POWER MICROWAVE RADIATION FROM INTERACTION OF A RELATIVISTIC ELECTRON BEAM WITH A PLASMA Ph.D. Thesis
David Tzach 1979 242 p
Avail: Univ. Microfilms Order No. 7920931

The mechanism of coherent curvature radiation from a relativistic electron beam rotating in a background plasma is investigated experimentally. Radiation is emitted in the Ka microwave band (26.5 - 40 GHz) and radiated power exceeded 10 MW in some experiments. The dependence of radiated power on plasma density, magnetic field and beam energy is investigated. A good agreement with theory is shown. Microwave pulse length was found to depend on the properties of the background plasma. The microwave pulses, with highly ionized plasma are as long as the electron beam pulse for beam pulses up to a microsecond long. Radiation was found to be polaried in very close agreement with calculations made using the single particle synchrotron radiation theory. Possible applications to the measurement of the pitch angle of relativistic electron beam rotating in a plasma are discussed. Dissert. Abstr.

N79-34023 Rice Univ., Houston, Tex.
ELECTRON BEAM ENERGY DISTRIBUTIONS DURING PLASMA INTERACTIONS Ph.D. Thesis
Robert Jerry Jost 1979 114 p
Avail: Univ. Microfilms Order No. 7919598

Electron beam plasma interactions in a simulated ionospheric environment were studied. An electron beam, variable in energy from 1.5 to 2 keV with currents up to 60 ma, was injected into the chamber along a uniform magnetic field (1.5 G) to a collector approximately 20 meters away. A column of low density neutral plasma was produced by beam ionization of the ambient gas. For certain conditions the occurrence of a beam plasma discharge (BPD) that produced intense optical photon emission and strong RF fields at the plasma and electron cyclotron frequencies was identified. Electron beam energy distributions were studied to determine differences in beam structure between the sub BPD and BPD modes. The energy distributions were obtained indirectly by measuring the beam induced X-ray emission from the collector with a NaI(Tl) X-ray detector. Dissert. Abstr.

N79-34024 Rice Univ., Houston, Tex.
HF-INDUCED PLASMA WAVES IN IONOSPHERIC SPORADICE Ph.D. Thesis
Frank Thomas Djuth 1979 265 p
Avail: Univ. Microfilms Order No. 7919577

A 430 MHz backscatter radar is used to diagnose the interaction of a powerful HF radio wave in a sporadic E plasma. Resonant enhancements in the plasma line spectrum are observed to peak at the purely growing mode, (430 Mhz tor - f sub HF where f sub HF is the HF frequency. Altitude profile measurements of the scattered radar signal reveal sporadic E enhancements at the ion line as well as at the two plasma lines. On the few occasions when plasma line excitation is observed outside of sporadic E in the upper E region between 130 km and 140 km altitude, only decay mode enhancements are evident. The sporadic E plasma line enhancements along with the accompanying ion line enhancements are attributed to an HF induced oscillating two stream instability, which is parametrically driven near minimum threshold. Possible saturation mechanisms are examined. Dissert. Abstr.

N79-34025 Texas Univ., Austin.
VARIATIONAL CALCULATION OF ELECTRON RESPONSE IN PLASMA WAVES AND IMPURITY TRANSPORT IN THE COLLISIONAL REGIME WITH LARGE POLOIDAL ELECTROSTATIC VARIATION Ph.D. Thesis
Choong-Seock Chang 1979 78 p
Avail: Univ. Microfilms Order No. 7920096

In the first part, a variational theory is used to calculate the electron's linear response to electromagnetic perturbations in the presence of the general collision frequency, temperature gradient, and density gradient. In the second part, the possibility of large electrostatic variation near the edge region of a toroidal plasma column is studied by using the fluid equations, assuming all plasma species to be collision dominated. Dissert. Abstr.

N79-34026 Boston Coll., Chestnut Hill, Mass.
APPLICATION OF OPERATOR METHODS TO AN INHOMOGENEOUS PLASMA IN A SHEARED MAGNETIC FIELD Ph.D. Thesis
William Francis Bellew 1979 138 p
Avail: Univ. Microfilms Order No. 7920482

An operator formalism is applied to the solution of the Vlasov equation in order to solve for the perturbed distribution function of a hot inhomogeneous plasma in a sheared magnetic field. The equation is solved by means of operator inversion and Lie-algebraic techniques used to normal order the resultant exponential operator, which is made up of two coupled sets of noncommuting operators. As a consequence of normal ordering the particle trajectories appear as coefficients of the operators. The main effect of magnetic shear on the particle orbits is to produce a kinematic drift, which we call the Shear Kinematic Drift (SKD). The perturbed density is expressed in terms of an exponential operator, operating on the electrostatic potential. The particular question studied is the stabilization of the low frequency drift wave, which arises in a spatially inhomogeneous plasma in a magnetic field. Dissert. Abstr.

N79-34027 California Univ., San Diego.
PROBLEMS IN COHERENT WAVE-WAVE INTERACTIONS IN A PLASMA Ph.D. Thesis
Delores Ann Walters 1979 144 p
Avail: Univ. Microfilms Order No. 7921506

Two problems involving coherent wave-wave interactions are discussed. The influence of the medium is expressed through tensor dielectric operators in the macroscopic Maxwell equations. The coupled equations are derived for sets of 3 wave interactions using a fast and slow time scale expansion. The first problem involves consideration of four longitudinal waves coupled in two sets of 3 wave interactions. Analytic solutions are obtained which indicate that depending on the relative magnitudes of the coupling constants, a strong triplet may stabilize a weak triplet against explosive instabilities. The second problem involves defining the spin angular momentum for transverse waves propagating in an isotropic medium or in a medium with an axis of symmetry. Spin angular momentum is found to be the projection of wave angular momentum in the direction of propagation.
Dissert. Abstr.

N79-34028 Rensselaer Polytechnic Inst., Troy, N. Y.
DESIGN CONSTRUCTION AND OPERATION OF A SMALL RESEARCH GRADE TOKAMAK Ph.D. Thesis
James Frederick Pipkins 1979 182 p
Avail: Univ. Microfilms Order No. 7922237

The generation of an equilibrium plasma in a small research

grade Tokamak in a highly nonsymmetric configuration is discussed. Single particle motion in symmetric devices, equilibrium in symmetric devices, effects of ripples on transport, and an analysis of magnetic surface disruption caused by ripple fields in a toroidal device are examined. Simple design criteria are developed for the various capacitor designs from energy balance analysis. The procedure used to obtain the final equilibrium configuration via a simple technique is presented. Dissert. Abstr.

N79-34029 California Univ., San Diego.
ONE-DIMENSIONAL INHOMOGENEOUS PLASMA AND THE ELECTROSTATIC DOUBLE LAYER Ph.D. Thesis
Philip Morrison, Jr. 1979 213 p
Avail: Univ. Microfilms Order No. 7921488

The one dimensional plasma equilibria with the double layer structure is discussed. Equilibria of this type may possess distribution functions which are functions of the energy alone. A distribution function expanded in terms of a series involving Laguerre polynomials is presented. An explicit double layer model containing two interpenetrating cold beams (one electron and one ion), together with back ground populations is developed. A stability analysis, facilitated by employing the localizing approximation, is performed. A classical perturbation expansion using the wave amplitude and the ratio of the wavelength to the characteristic scale length of the medium as small parameters, yields the energy flux conserving approximation. Dissert. Abstr.

N79-34030 Dartmouth Coll., Hanover, N.H.
ELECTROSTATIC WAVES IN AN INHOMOGENEOUS PLASMA Ph.D. Thesis
Richard Peter Majeski 1979 162 p
Avail: Univ. Microfilms Order No. 7921592

Small amplitude electron plasma waves are studied in the presence of a temporally modulated plasma density. Coupling of plasma waves through such a density modulation is modeled using the two fluid equations. The generation of wave sidebands is shown and a periodic exchange of energy among the wave sidebands is predicted. The coupling of plasma waves through a spatial density ripple is examined. Dissert. Abstr.

N79-34031 Dartmouth Coll., Hanover, N.H.
ON THE QUANTUM KINETIC THEORY OF HIGH ENERGY PLASMAS Ph.D. Thesis
Roger Dale Jones 1979 237 p
Avail: Univ. Microfilms Order No. 7922204

A formalism is developed that simplifies quantum mechanical calculations for diffuse high energy plasmas. The formalism uses a mixture of classical and Green's function techniques in a manner that separates screening phenomena from phenomena that involve large momentum transfer between particles. Completely convergent kinetic equations for both Coulomb and slightly relativistic plasmas are obtained in two ways (1) physically, and (2) through the use of the above formalism. Spin-spin, spin-orbit, magnetic Darwin, and Coulomb interactions are all taken into account in the slightly relativistic treatment. The formalism is also used to obtain the high frequency conductivity and bremsstrahlung spectrum of a magnetized Coulomb plasma. Dissert. Abstr.

N79-34032# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SOME BASIC PLASMA PHENOMENA
J. A. Bittencourt Jul. 1979 46 p Revised
(INPE-1502-RPE/042) Avail: NTIS HC A03/MF A01

Electron plasma oscillations and the Debye shielding problem are analyzed using the macroscopic transport equations for each particle species in the plasma. The illustrate the use of the phase space distribution functions, the problem of the Debye potential is also analyzed in terms of the Vlasov equation. The physical mechanism of formation of the plasma sheath, near a boundary will in the plasma, and an approximate quantitative description of the inner structure of the sheath, are also presented as an application of the properties of the plasma sheath, the Langmuir plasma probe, which is widely used to measure plasma properties, is analyzed. A.R.H.

N79-34033# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SIMPLE APPLICATIONS OF MAGNETOHYDRODYNAMICS
J. A. Bittencourt Jul. 1979 46 p Revised
(INPE-1516-RPE/052) Avail: NTIS HC A03/MF A01

A derivation of Parker's modified momentum equation is presented as well as the Chew, Goldberger and Low double adiabatic energy equations. Some special cases of the double adiabatic equations are analyzed. The concepts of magnetic viscosity and magnetic Reynolds number are introduced, and the phenomena of diffusion of the magnetic field lines through a plasma, and of freezing of the magnetic field lines to the plasma are considered. Magnetic pressure is examined and plasma confinement in a magnetic field is investigated. A.R.H.

N79-34034# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MACROSCOPIC EQUATIONS FOR A CONDUCTING FLUID
J. A. Bittencourt Jul. 1979 33 p Revised
(INPE-1515-RPE/051) Avail: NTIS HC A03/MF A01

A derivation of the macroscopic transport equations for a plasma, considered as a single conducting fluid is presented. The equations of conservation of mass, of momentum, and of energy, for the plasma as a whole, are derived starting from the corresponding equations for each individual species constituing the plasma. These equations are complemented by a set of electrodynamic equations for a conducting fluid. A detailed derivation is given for the generalized Ohm's law. The complete set of simplified magnetodynamic (MHD) equations, normally used in MHD problems, is also presented and the approximations involved are discussed. Author

N79-34035# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MOTION OF CHARGED PARTICLES IN TIME-VARYING ELECTROMAGNETIC FIELDS
J. A. Bittencourt Jul. 1979 41 p
(INPE-1504-RPE/044) Avail: NTIS HC A03/MF A01

The motion of charged particles in the presence of an electric field varying slowly in time, and with an arbitrary time variation is analyzed as well as charged particles in the presence of a time-varying magnetic field and a space-varying electric field. The phenomenon of cyclotron resonance, and the process of magnetic heating of a plasma are also discussed. A.R.H.

N79-34036# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
WAVES IN HOT ISOTROPIC PLASMAS
J. A. Bittencourt Sep. 1979 54 p Revised
(INPE-1563-RPE/068) Avail: NTIS HC A04/MF A01

The problem of wave propagation in a hot isotropic plasma, in the absence of an externally applied magnetic field, from the point of view of kinetic theory, using the Vlasov equation. The characteristics of the longitudinal plasmas mode and the transverse electromagnetic mode are examined. The problem of wave-particle interaction is also analysed, and the phenomenon of collisionless Landau damping and for the two-stream instability is described. A.R.H.

N79-34037# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
MAGNETOHYDRODYNAMIC WAVES
J. A. Bittencourt Jul. 1979 37 p
(INPE-1523-RPE/058) Avail: NTIS HC A03/MF A01

The propagation of very low frequency waves in a highly conducting fluid was analyzed. The characteristics of these MHD waves are investigated for propagation parallel, perpendicular, and in an arbitrary direction, with respect to an externally applied magnetic field. The effects of the displcement currents, and of viscosity, on wave propagation are also considered. A.R.H.

N79-34038# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE PINCH EFFECT
J. A. Bittencourt Jul. 1979 41 p Revised
(INPE-1520-RPE/056) Avail: NTIS HC A04/MF A01

A detailed treatment of the pinch effect is presented for the special case in which the confinement is produced by an aximuthal self-magnetic field, due to an axial current in the pinched plasma column. A detailed analysis is given for the equilibrium

pinch, the Bennett pinch, and the dynamic pinch. The geometrical instabilities which are commonly present in a pinched plasma column, known as the sausage instability and the kink instability, are discussed. The addition of stabilizing fields to the inched plasma column, and some convex field configurations, which provide a stable magnetic field confinement, are also described. J.M.S.

N79-34039# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
WAVES IN COLD PLASMAS
J. A. Bittencourt Aug. 1979 79 p refs Revised
(INPE-1546-RPE/066) Avail: NTIS HC A05/MF A01

The problem of wave propagation in a cold electron plasma is analyzed. Initially, the basic equations of magnetoionic theory, and their solution in terms of plane waves, are presented. The characteristics of high frequency wave propagation in isotropic electron plasmas, in the absence of an externally applied magnetic field, are analyzed. The problem of wave propagation in a cold, anisotropic plasma, immersed in a magnetic field is considered. The general dispersion relation and the Appleton-Hartree equation are derived, and the various modes of wave propagation in directions parallel and perpendicular to the magnetic field are investigated. The properties of the CMA diagram are also described. An analysis of atmospheric whistler propagation, helicons, and the phenomenon of Faraday rotation in plasmas is presented. J.M.S.

N79-34040# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
WAVES IN WARM PLASMAS
J. A. Bittencourt Aug. 1979 55 p
(INPE-1547-RPE/067) Avail: NTIS HC A04/MF A01

The problem of wave propagation in a warm electron gas and in a warm, fully ionized plasma is analyzed considering cases when there is no magnetic field present and cases when the plasma is immersed in an externally applied magnetic field. The various possible modes of wave propagation are described and special emphasis is given to those aspects which are related with the pressure gradient terms in the equations of motion for each particle species. The various modes of wave propagation in a fully ionized, warm plasma are summarized. K.L.

N79-34041# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
PLASMA CONDUCTIVITY AND DIFFUSION
J. A. Bittencourt Jul. 1979 58 p Revised
(INPE-1503-RPE/043) Avail: NTIS HC A04/MF A01

The phenomena of electrical conductivity and diffusion in plasmas is analyzed. Expressions are derived for the DC and AC conductivity of anisotropic plasma, as well as of an anisotropic magnetoplasma, using the macroscopic equations pertinent to the cold plasma model. The problems of free diffusion and ambipolar diffusion in plasmas, are analyzed in terms of the warm plasma model. Diffusion in a fully ionized plasma is also discussed, using the magnetohydrodynamic equations. A.W.H.

N79-34042# California Univ., Berkeley. Electronics Research Lab.
PLASMA THEORY AND SIMULATION Quarterly Progress Report, 1 Oct. - 31 Dec. 1978
C. K. Birdsall 31 Dec. 1978 37 p refs
(Contracts N00014-77-C-0578; EY-76-S-03-0034)
(AD-A071758; QPR-4) Avail: NTIS HC A03/MF A01 CSCL 20/9

Our research group uses both theory and simulation as tools in order to increase the understanding of instabilities, heating, transport, and other phenomena in plasmas. We also work on the improvement of simulation, both theoretically and practically. GRA

N79-34043# Naval Research Lab., Washington, D. C.
SPECTROSCOPY AND X-RADIATION FROM EXPLODED-WIRE ARRAYS AND GAS-PUFF PLASMAS Interim Report
P. Burkhalter and J. Davis 16 Mar. 1979 95 p refs
(AD-A072018; AD-E000303; NRL-MR-3934) Avail: NTIS HC A05/MF A01 CSCL 20/9

In this report results are presented for three separate experiments involving multiple exploded wire arrays and puff gas plasmas. The first section deals with the analysis and interpretation of X-ray line spectra from a variety of exploded multiple wire arrays including Al, glass, Ti, SS, Mo, and W wires. The second section deals with X-ray spectra from puff gas experiments at PI(Physics International) for Ne, Ar, Kr, and Xe gases. Finally, we conclude with a discussion of X-ray spectra from a gas puff Z-pinch device, operated at the University of California, Irvine, that provides both spatial and spectral information of Ar X-ray emission. GRA

N79-34044# Los Alamos Scientific Lab., N. Mex.
MHD DECELERATION OF FUSION REACTION PRODUCTS
S. Chow and I. O. Bohachevsky Apr. 1979 20 p refs
(Contract W-7405-eng-36)
(LA-7778-MS) Avail: NTIS HC A02/MF A01

The feasibility of magnetohydrodynamic (MHD) deceleration of fuel pellet debris ions exiting from an inertial confinement fusion (ICF) reactor cavity was investigated using one-dimensional flow equations. For engineering reasons, induction-type devices are emphasized; their performance characteristics are similar to those of electrode-type decelerators. Results presented indicate that MHD decelerators can be designed within conventional magnet technology to not only decelerate the high-energy fusion pellet debris ions, but also to produce some net electric power in the process. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N79-34045 Wisconsin Univ. - Milwaukee.
SURFACE ACOUSTIC WAVE INVESTIGATION OF Nb3Ge FILM Ph.D. Thesis
Harry Louis Salvo, Jr. 1979 140 p
Avail: Univ. Microfilms Order No. 7923455

The measurements of the attenuation of a surface wave at 1190 MHz by a superconducting .5 microns thick film of Nb3Ge are presented. The Nb3Ge film was RF sputtered onto a piezoelectrically active AlN film, 3.2 microns thick, which was enemically vapor deposited on an R plane sapphire substrate. The film has a homogeneous distribution of superconducting material with different transition temperatures. The distribution function is determined from both the ultrasonic data and the resistivity data. The distribution function determined ultrasonically is quite different from that determined electrically. The discrepancy between them is shown. The distribution function determined ultrasonically is reported to be a better characterization of the film. The ultrasonic data predicts that for the particular sample measured, the largest amount of Nb3Ge is going to be superconducting at 18 K not 21.5 K. Dissert. Abstr.

N79-34046 Colorado State Univ., Fort Collins.
DIELECTRIC-SEMICONDUCTOR INTERFACES OF GALLIUM ARSENIDE AND INDIUM PHOSPHIDE Ph.D. Thesis
Larry G. Meiners 1979 143 p
Avail: Univ. Microfilms Order No. 7923364

The properties of insulator-semiconductor structures formed using the semiconductors InP and GaAs in conjunction with a number of dielectrics are investigated. The insulators studied on GaAs were the native oxide formed by anodization, sputtered silicon nitride, and pyrolytically deposited silicon nitride. The investigation of InP was limited to the study of pyrolytically deposited silicon dioxide layers. Capacitance-voltage measurements over a wide frequency range and surface photovoltage measurements on metal insulator semiconductor diodes formed from these structures were used to determine the bulk doping, surface potential variation, and interface state density of the semiconductor. Dissert. Abstr.

N79-34047 Arizona Univ., Tucson.
MAGNETIC BREAKDOWN DOMINATED ELECTRON TRANSPORT IN ULTRA-PURE METALS Ph.D. Thesis

David Morrison 1979 137 p
Avail: Univ. Microfilms Order No. 7923388

Electronic transport properties in pure, compensated, divalent, hcp metals in high magnetic fields are dominated by magnetic breakdown coupling between systems of orbits on different branches of the Fermi surface. The effects of such coupling on the electronic distribution function in beryllium when the magnetic field lies along /0001/ are calculated. A significant deviation from equilibrium occurs in the occupation of states participating in coupled orbit conduction under constant current conditions. The dependence of this calculated disequilibrium on current and magnetic field strength is in qualitative agreement with observations of an unusual, nonohmic emf. The transverse magnetoresistivity of magnesium for the case in which the magnetic field lies nearly, or exactly, along /10(-1)0/, in the plane perpendicular to /11(-2)0/, with the current along /11(-2)0/ is calculated.
Dissert. Abstr.

N79-34048 California Univ., San Diego.
INTRINSIC MAGNETIC HARDNESS IN DISORDERED SOLIDS Ph.D. Thesis
Mark Barry Misroch 1979 424 p
Avail: Univ. Microfilms Order No. 7921487

The existence of giant intrinsic magnetic hardness in disordered intermetallics of high crystal anisotropy are reported. Rare earth-transition metal compound series were studied to understand this effect. The coercive forces measured at cryogenic temperatures represent the largest values ever recorded. Magnetic data revealing the concentration (composition) and temperature dependence of intrinsic hardness on systems are presented. The phenomenology of disordered solids is discussed and results are given demonstrating similar magnetic behavior in crystalline and amorphous solids. Data are presented on the complex freezing phenomena apparent in ferrimagnetic systems. Dissert. Abstr.

N79-34049 California Inst. of Tech., Pasadena.
SCHOTTKY BARRIERS ON COMPOUND SEMICONDUCTORS. 1: HgSe HIGHLY ELECTRONEGATIVE CONTACTS. 2: Au SCHOTTKY BARRIERS ON n-Ga(1-x)Al(x)As Ph.D. Thesis
John Stewart Best 1979 110 p
Avail: Univ. Microfilms Order No. 7922043

The HgSe is deposited on various semiconductors forming a semimetal/semiconductor Schottky barrier structure. Polycrystalline, evaporated HgSe produces larger Schottky barrier heights on n type semiconductors than does Au, the most electronegative of the elemental metals. The barrier heights are about 0.5 eV greater than those of Au on ionic semiconductors such as ZnS, and 0.1 to 0.2 eV greater for more covalently bonded semiconductors. The Schottky barrier height of Au on chemically etched N-Ga sub 1-x Al sub x As was measured as a function of x. As x increases, the barrier height rises to a value of about 1.2 eV at approximately equals 0.45, then decreases to about 1.0 eV as x approaches 0.83. The barrier height deviates in a linear way from the value predicted by the common anion rule as the AlAs mole fraction increases. Dissert. Abstr.

N79-34050 Rensselaer Polytechnic Inst., Troy, N. Y.
ALKALI METAL ION MOTION AND STRUCTURAL CHANGES IN BETA-ALUMINA SOLID ELECTROLYTES Ph.D. Thesis
Robert Revel Dubin 1979 185 p
Avail: Univ. Microfilms Order No. 7922228

Pulsed nuclear magnetic resonance (NMR), continuous wave NMR, and X-ray diffraction measurements were used to determine mobile ion activation energies, motion, and site changes in single crystal and sintered lithium sodium beta alumina solid electrolytes. Spin lattice relaxation times (T sub 1) and observed linewidths (I sub 2*) for Li-7 in single crystal Li-Na beta alumina (71% Li(+) exchange), prepared by ion exchange, were determined by pulsed NMR as a function of temperature and rotation angle. Both I sub 1 and I sub 2* showed a noticeable dependence on rotation angle. Spin echoes were not detectable at room temperature, though they were observed at 155 K indicating inhomogeneous line broadening at low temperature.
Dissert. Abstr.

N79-34051*# Guests Associates, Inc., Huntsville, Ala. Advanced Materials Div.
CRYSTAL GROWTH CONFIGURATION THERMAL ANALYSIS Final Technical Report
Lawrence R. Holland and Terence A. Whitt 30 Sep. 1979 24 p refs
(Contract NAS8-33204)
(NASA-CR-161317; AMD-79-TR2) Avail: NTIS HC A02/MF A01 CSCL 20B

Thermal analysis of selected crystal growth systems being considered for space processing is presented. The physical problems associated with the growth of single crystals from solid solution systems are discussed. Special furnace configurations (suitable geometries and growth conditions) for producing high thermal gradients and stable liquid-solid interface shapes required for crystal growth are investigated. A.W.H.

N79-34052# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
FUNCTIONAL INTEGRAL APPROACH TO THE STATIC SUSCEPTIBILITY OF THE ANDERSON MODEL
R. Kishore May 1979 26 p refs Revised Submitted for publication
(INPE-1491-RPE/035) Avail: NTIS HC A03/MF A01

The Coulomb interaction at the magnetic impurity is represented by the random fields coupled to the charge and the spin fluctuations. On treating the charge fluctuations within extremal approximation, the free energy functional is approximated by its potential part plus the harmonic terms in its kinetic part. Within this approximation, functional integral is evaluated over all the paths using transfer matrix technique. The static susceptibility reduces to an expression of a system of independent particles moving in one dimensional potential. In weak coupling limit U/pi delta < 1, U is the Coulomb interaction at the impurity and Delta is the width of its virtually bound d state), it behaves like Pauli susceptibility and coincides with perturbation theory results, up to first order in U/pi delta. In strong coupling limits (U/pi delta > 1), at low temperatures, it shows the tendency to saturation (Kondo effect) and, at high temperatures, behaves like a Curie susceptibility and coincides with the perturbation results, up to first order in Pi delta /U. Author

N79-34053# Army Armament Research and Development Command, Watervliet, N. Y. Benet Weapons Lab.
MAGNETIC MOMENT OF PRESSURE QUENCHED CADMIUM SULFIDE
C. G. Homan, D. R. Kendall, and R. K. MacCrone May 1979 19 p refs Presented at Physics Colloq. at RPI, Troy, N. Y., 18 Apr. 1979
(DA Proj. 1L1-16110-2H-60)
(AD-A070533; AD-E440029; ARLCB-TR-79006) Avail: NTIS HC A02/MF A01 CSCL 20/12

Magnetic moment measurements of cadmium sulfide (CdS) polycrystalline samples, pressure quenched from above the semi-conducting to conducting transition pressure (40 kbars) at rates approaching 1,000,000 bars/sec, have been made in a vibrating sample magnetometer to fields approaching 1000 Oersted. The samples exhibit the complex magnetic behavior of low field diamagnetism transforming at fields of several hundred Oersted to positive magnetism. GRA

N79-34054# Colorado State Univ., Fort Collins. Dept. of Physics.
ION BEAM SPUTTERED AlOxNy ENCAPSULATING FILMS
Huelya Birey, Sung-Jae Pak, J. R. Sites, and J. F. Wager May 1979 22 p refs
(Contract N00014-76-C-0976; RR0210203)
(AD-A070863; SF-17) Avail: NTIS HC A02/MF A01 CSCL 20/12

The encapsulating properties of 800-1500 A aluminum oxynitride films, deposited on GaAs by low energy ion beam sputtering, were characterized by optical microscopy, electrical conductivity, Auger profiling, and ellipsometry. The better films were found to withstand annealing to above 900 C with minimal physical deterioration. GRA

N79-34055# Colorado State Univ., Fort Collins. Dept. of Physics.

DEPTH AND CARRIER CONCENTRATION OF PHOTOLUMINESCENCE FEATURES IN HEAT TREATED GaAsSi
Hulya Birey and James R. Sites May 1979 17 p refs
(Contract N00014-76-C-0976)
(AD-A070809) Avail: NTIS HC A02/MF A01 CSCL 20/12

The photoluminescence (PL) spectra of silicon doped n-type GaAs of four different carrier concentrations from 4 x 10 to the 15th power to 3 x 10 to the 18th power/cc were examined. Successive measurements as the samples were annealed for times from 15 to 60 minutes at 600-700 C, and as they were successively etched back, revealed that all PL changes were surface related, with a typical depth of 1 micron. GRA

N79-34056# Naval Research Lab., Washington, D. C.
GaAs FET DEVICE FABRICATION AND ION IMPLANTATION TECHNOLOGY (MICROWAVE 3-5 COMPOUND SEMICONDUCTORS) Annual Summary Report, 1 Oct. 1977 - 30 Sep. 1978
Kenneth J. Sieger and Harry B. Dietrich 27 Jun. 1979 29 p refs
(ZF54581001)
(AD-A070783; NRL-MR-4020) Avail: NTIS HC A03/MF A01 CSCL 20/12

Microwave Schottky barrier FETs and ion implantation have been selected to provide a bench mark technology for evaluation of III-V compound semiconductor materials grown at NRL and elsewhere. FETs used here employ a nominal one micron gate length and are processed by a combination of conventional contact photolithography and liftoff techniques. Ion implantation studies have centered about creating doping profiles suitable for active layers in GaAs and InP FETs using semi-insulation (SI) substrates. These substrates are previously qualified by capping with plasma deposited Si3N4 and annealing between 800 C and 850 C for 15-30 minutes (GaAs) or 700 C - 750 C for 15 minutes (InP). Samples which show surface conversion after the anneal are rejected. NRL has demonstrated proficiency in being able to implant, cap and anneal both GaAs and InP SI substrates. GaAs FETs were fabricated on ion implanted NRL SI substrates (unintentionally doped) and on commercially supplied Cr doped SI GaAs with epitaxial channel regions. At 8 GHz the noise figure ranged from 3.4 dB - 3.8 dB with 6-8 dB associated gain for these devices. Differences in microwave performance between ion implanted and epitaxial FET was correlated to differences in mobility and velocity profiles obtained from FAT FET test structures and actual microwave FET devices, respectively. Results suggest the need for improvement in FET process technology and capping technology. GRA

N79-34057# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering, Aeronautical Engineering and Mechanics.
THE GROWTH OF WAVE DISCONTINUITIES IN PIEZOELECTRIC SEMICONDUCTORS
M. F. McCarthy and H. F. Tiersten Jun. 1979 36 p refs
(Contract N00014-76-C-0368; Grant NSF ENG-72-04223)
(AD-A070990; TR-28) Avail: NTIS HC A03/MF A01 CSCL 20/12

The reference coordinate description of the general nonlinear differential equations describing the interaction of finitely deformable, polarizable, intrinsic n-type semiconductors with the quasi-static electric field is applied in the study of acceleration waves in piezoelectric semiconductors. As a consequence, the mechanical and dielectric nonlinearities are included in the treatment as well as the semiconduction nonlinearity. The general equation for the propagation velocity of the disturbance is obtained as a function of the state of the material immediately ahead of the wavefront. In the special case of plane waves entering a homogeneous steady state, the growth equation for the amplitude of the acceleration wave is determined and, of course, the propagation velocity and coefficients in the growth equation depend on the propagation direction, but otherwise are constant. The relation between acceleration waves and the formation and propagation of acoustoelectric domains is indicated. The solutions of the growth equation indicate the formation of a shock in a finite time for conditions conducive to domain formation except in certain unusual cases possibly occurring with purely transverse acceleration waves. In the course of the treatment the condition for the threshold field for domain formation is determined under quite general circumstances. GRA

N79-34058# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
CALCULATION OF THE FREE CARRIER DENSITY PROFILE IN A SEMICONDUCTOR NEAR AN OHMIC CONTACT
Amitabh Chandra 22 Jun. 1979 7 p
(Contract N00014-75-C-0739)
(AD-A071739) Avail: NTIS HC A02/MF A01 CSCL 20/12

In this note, a quantitative attempt is made to answer the question 'To what depth does the equilibrium free carrier density penetrate into a low doped semiconductor from a heavily doped region interfacing it.' The simple answer 'A few Debye lengths' can sometimes prove to be inadequate. GRA

N79-34059# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
GROWTH AND CHARACTERIZATION OF HIGH PURITY LATTICE MATCHED GaInAs ON InP
James D. Oliver and Lester F. Eastman 22 Jun. 1979 2 p refs Presented at Electronic Materials Conf., 22 Jun. 1979
(Contract N00014-75-C-0739)
(AD-A071738) Avail: NTIS HC A02/MF A01 CSCL 20/12

The high mobility of GaInAs allows its potential use as a field effect transistor active layer in either microwave, or high speed logic applications, provided that doping levels can be adequately controlled. Previous studies have identified silicon as the major residual donor in InP(2) and GaAs. Here, we report on the highest purity GaInAs produced, by carefully controlling the incorporation of silicon. GRA

N79-34060# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
THE LIQUID PHASE EPITAXIAL GROWTH OF HIGH PURITY, Ga(1-x)Al(x)As
Amitabh Chandra and Lester F. Eastman 22 Jun. 1979 27 p refs
(Contract N00014-75-C-0739)
(AD-A071737) Avail: NTIS HC A03/MF A01 CSCL 20/12

We report the high purity in the LPE growth of n Ga(1-x)Al(x)As (O = or < x or = or < .3) at 700 - 675 C. Carrier concentrations at or below 10 to the 15th power/cc have been consistently obtained, the lowest value achieved being under 3 x 10 to the 14th power/cc at x = .15. It has been shown that these low carrier concentrations do not result from a high compensation ratio. We believe that a dominant shallow donor impurity (thought to be sulphur) is introduced into the melt with the aluminum. We find that the second epigrowth from a melt is significantly purer than the first, presumably due to the extra baking. GRA

N79-34061# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
A METHOD TO OVERCOME THE PROBLEM OF SERIES RESISTANCE IN THE CAPACITANCE-VOLTAGE TECHNIQUE FOR CARRIER DENSITY DETERMINATION
Amitabh Chandra 22 Jun. 1979 8 p refs
(Contract N00014-75-C-0739)
(AD-A071736) Avail: NTIS HC A02/MF A01 CSCL 20/12

The net donor density of n type GaAs epitaxial layers is commonly determined from capacitance voltage measurements made on a Schottky barrier deposited on the epitaxial layer. The back ohmic contact is usually alloyed to the substrate, if it is n type, or to the layer itself, if the substrate is semiinsulating. In the latter case, the resistance R in series with the Schottky diode capacitance C can be significant and can introduce an error in the determination of C. In this note, a practical solution to the problem is proposed. GRA

N79-34062# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.
A STUDY OF ALLOY SCATTERING IN Ga(1-x)Al(x)As
Amitabh Chandra and Lester F. Eastman 22 Jun. 1979 31 p refs
(Contract N00014-75-C-0739)
(AD-A071735) Avail: NTIS HC A03/MF A01 CSCL 20/12

The temperature dependence of electron mobility of high

purity (n < 10 to the 15th power/cc) LPE Ga(1-x)Al(x)As layers (x < .18) has been studied in the range 25 deg K - 110 deg K to measure the extents of alloy-like and ionized impurity scattering. Values of the alloy scattering parameter Delta E (which may include a contribution from space charge scattering) determined for these samples were found to lie in the range .36 eV to .51 eV, the average being .44 eV. The compensation ratio was found to be about 2, and independent of x. GRA

N79-34063# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.

SURFACE AND INTERFACE DEPLETION CORRECTIONS TO FREE CARRIER DENSITY DETERMINATIONS BY HALL MEASUREMENTS

Amitabh Chandra, Colin E. C. Wood, David W. Woodward, and Lester F. Eastman 22 Jun. 1979 23 p refs
(Contract N00014-75-C-0739)
(AD-A071734) Avail: NTIS HC A02/MF A01 CSCL 20/12

Errors in the determination of (N(D)-N(A)) for semiconductor epitaxial layers by the Hall method can result if corrections for carrier depletion are omitted in the calculations. Simple practical procedures are discussed to correct for carrier depletion that occurs in epitaxial layers at their free surfaces, and their interfaces with semi-insulating substrates. Theoretical estimates of carrier depletion in GaAs indicate that depletion regions can extend several microns into high purity epitaxial layers, and can cause (N(D)-N(A)) to be considerably underestimated. Experimental evidence is presented in support of the theory. GRA

N79-34064# Cornell Univ., Ithaca, N. Y.

MICROWAVE SEMICONDUCTOR RESEARCH-MATERIALS, DEVICES, CIRCUITS Annual Technical Report, 1 Jun. 1978 - 30 Apr. 1979

L. F. Eastman, J. Frey, G. C. Dalman, C. A. Lee, and P. R. McIsaac 19 Jul. 1979 33 p refs
(Contract F49620-77-C-0069)
(AD-A071755) Avail: NTIS HC A03/MF A01 CSCL 20/12

Chromium doped pure LPE GaAs buffer layers have been tested to show that they do not conduct after baking with or without Si3N4 capping, and calibrated deep level transient spectroscopy has been used to measure the density of intended chromium traps as 3 to 4 x 10 to the 14th power/cu cm. Technology for obtaining quasi-Schottky barrier gates on quaternary compound semiconductor materials has been developed. A review of the entire field of Schottky barriers on compound semiconductors has been performed, and the results published. Two-dimensional numerical analyses have enhanced the understanding of the physical basis of MESFET operation. The influence of such materials parameters as shape of the velocity-field curves and nature of the diffusivity-field characteristics on parasitic elements in MESFET's has been determined. Expected performance of silicon, GaAs, and InP short-channel MESFET's has been compared. High power GaAs FET drain voltage breakdown has been extended to about 50 V and the Electric field geometry has been measured to show a Gunn domain with thickness and shape consistent with theory. GRA

N79-34065# Cornell Univ., Ithaca, N. Y. School of Electrical Engineering.

THE USE OF Al(x)Ga(1-x)As BUFFER LAYERS TO REDUCE PARASITIC SPACE CHARGE LIMITED CURRENT FLOW THROUGH THE SUBSTRATE IN FET STRUCTURES

Lester F. Eastman, David W. Woodward, Amitabh Chandra, and M. Shur 22 Jun. 1979 1 p
(Contract N00014-75-C-0739)
(AD-A071740) Avail: NTIS HC A02/MF A01 CSCL 20/12

A simple analysis has been made of the parasitic space charge limited current flow in a GaAs substrate or buffer. The computed output conductance is in agreement with experimental values of 600 to 1000 ohms obtained on low noise FET's with 300 micron gate width fabricated on GaAs buffer layers with low trap density. The parasitic current flows in the semi-insulating substrate or buffer layer, around the thin high field Gunn domain that is present in the active layer of the FET. Including the effects of changing domain length with drain bias, the parasitic current is found to rise as the square root of the drain voltage and as the 4th root of the active channel doping. GRA

N79-34066# Texas A&M Univ., College Station. Dept. of Electrical Engineering.

ADMITTANCE BEHAVIOR IN GaAs SCHOTTKY IMPATT DIODES Final Report, 1 Jun. 1978 - 31 May 1979

O. Eknoyan 1979 49 p refs
(Grant AF-AFOSR-3567-78; AF Proj. 2305)
(AD-A071949; AFOSR-79-0872TR) Avail: NTIS HC A03/MF A01 CSCL 20/12

This report presents the results of efforts, all of which are related to ionization rate effects on the admittance behavior of Low-High-Low gallium-arsenide (LHL GaAs) Schottky IMPATT diodes. The analysis was made using an improved equivalent circuit model which was developed earlier. The effects of reported different ionization rates in GaAs as well as newly generated ones were calculated and compared with experimentally measured admittance data. Generally, good agreement has been obtained. It is observed that (i) at low currents, the resonant frequency is less that the cutoff frequency and (ii) at high currents, the admittance behavior is capacitive. The results also indicate the possible existence of injection mechanisms other than impact ionization which become most apparent at high fields and are influenced by crystal orientation. GRA

N79-34067# Princeton Univ., N. J. Joseph Henry Labs. of Physics.

OPTICAL VERSUS TRANSPORT PROCESSES IN CHALCOGENIDE GLASSES

D. C. Licciardello and D. L. Stein Jun. 1979 11 p refs
(Contract N00014-77-C-0711; Grant NSF DMR-78-03015)
(AD-A072010) Avail: NTIS HC A02/MF A01 CSCL 20/12

A model for amorphous chalcogenide semiconductors predicts an intrinsic photoinduced paramagnetic band of metastable states which may absorb light and give rise to an electron spin resonance. It is shown that these centers are unrelated to those responsible for limiting carrier mobility in accord with recent experiments on doped a = As2Se3. GRA

N79-34068# Naval Research Lab., Washington, D. C. Microelectronics Branch.

NOISE MEASUREMENTS ON A P-SURFACE CHANNEL CCD MULTIPLEXER Interim Report, Mar. 1978 - Mar. 1979

W. C. Jenkins, J. M. Killiany, J. A. Modolo, and W. D. Baker 11 Jul. 1979 35 p refs
(XF54582002)
(AD-A071786; NRL-MR-4039) Avail: NTIS HC A03/MF A01 CSCL 20/12

The noise performance of a p-surface channel CCD multiplexer was measured at room temperature and at 160 K. Theoretical calculations were made of the contributions from KTC noise, dark current noise and interface state trapping noise. The calculated values agree well with the experimental results. The design goal for these devices was temporal noise voltage of 15 microvolts (3500 rms noise carriers) referenced to the input. Cooled to 160 K we measured a noise voltage of 16 microvolts (3750 rms noise carriers) referenced to the input. The spatial or fixed pattern noise was much larger: 12 millivolts (2.9 x 10 to the 6th power rms noise carriers) referenced to the input. The noise measured on a device irradiated to 10,000 Rad(Si) under bias was approximately twice the value for an unirradiated device. GRA

N79-34069# Colorado State Univ., Fort Collins. Dept. of Physics.

PHOTOLUMINESCENCE OF GALLIUM ARSENIDE ENCAPSULATED WITH ALUMINUM AND SILICON NITRIDE FILMS

Huelya Birey (Istanbul Univ.), Sung-Jae Pak (Seoul Natl. Univ.), and J. R. Sites May 1979 14 p refs
(Contract N00014-76-C-0976)
(AD-A070866; SF-23) Avail: NTIS HC A02/MF A01 CSCL 20/12

Aluminum and silicon nitride films were deposited on lightly doped n-type GaAs:Si by low energy ion beam sputtering. The films showed no signs of deterioration when annealed at 900 C, and the GaAs photoluminescence spectra showed new features only at the higher annealing temperatures. GRA

N79-34070# National Bureau of Standards, Washington, D. C. National Measurement Lab.
NBS REACTOR: SUMMARY OF ACTIVITIES, Technical Note, 1 Jul. 1977 - 30 Jun. 1978
Frederick J. Shorten May 1979 149 p refs
(PB-296267/8; NBS-TN-995) Avail: NTIS HC A07/MF A01 CSCL 20L

Programs which depend on the NBS reactor are summarized for the period from July 1977 through June 1978. Topics covered include the use of neutron beams to study the structure and dynamics of materials through nuclear physics and neutron standards, sample irradiations for activation analysis, isotope production, radiation effects studies, neutron radiography, and nondestructive evaluations. GRA

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N79-34071 Washington State Univ., Pullman.
ON THE FOUNDATIONS OF QUANTUM THERMODYNAMICS Ph.D. Thesis
Ralph Francis Simmons, Jr. 1979 87 p
Avail: Univ. Microfilms Order No. 7923514

The entropy of a system is an observable property but is not the expectation value of a quantum mechanical operator. This point and its effect on the interpretation of the time evolution of the entropy are discussed. The projection postulate or linear semigroup evolution is inadequate to describe the irreversible approach to equilibrium of a closed system when any postulate of dynamics is based on unitary evolution. The conditions satisfied by the correct evolution are discussed and followed by an example of an equation of motion for the density operator which satisfies these conditions. The extent which a quantum mechanical theory predicts the laws of thermodynamics is discussed. Dissert. Abstr.

N79-34072# Space Sciences, Inc., Monrovia, Calif.
DISSOCIATION ENERGIES AND HEATS OF FORMATION OF GASEOUS METALLIC HALIDES Final Report, 1 May 1974 - 30 Apr. 1979
Milton Farber Jun. 1979 11 p refs
(Contract F44620-74-C-0075; AF Proj. 2308)
(AD-A071922; AFOSR-79-0852TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

This report summarizes the experimental thermodynamic data obtained, including dissociation energies and heats of formation, for the species BaO, MgO, CaO, SrO, NiO, MgCl, SiCl, SiCl2, SiCl3, SiF2, SiF3, SiBr, SiBr2, SiBr3, SiH2F2, SiF, SiH3F, SiHCl3, SiH2Cl2, SiH3Cl, SiH2Br3, SiH2Br2, SiH3Br and SiHF3. GRA

N79-34073# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
FILTERING THEORY AND QUANTUM FIELDS Interim Report
Sanjoy K. Mitter Apr. 1979 9 p refs Presented at the Conf. on Algebraic and Geometric Methods in Systems Theory, Bordeaux, France, Sep. 1979
(Grant AF-AFOSR-3281-77; AF Proj. 2304)
(AD-A071100; LIDS-P-902; AFOSR-79-0812TR) Avail: NTIS HC A02/MF A01 CSCL 20/10

In this paper we describe certain remarkable connections that exist between mathematical developments in quantum field theory (and euclidean field theory) and filtering theory (and in general system theory). Roughly speaking, the Kalman filter is the mathematical analog of a free quantum field (in a precise sense) and the study of non-linear filtering is the analog of the study of interacting quantum fields. Due to lack of space we only sketch this theory in this paper and the details of this work will be presented elsewhere. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N79-34074*# ESC Energy Corp., Daly City, Calif.
DISTRIBUTION AUTOMATION AND CONTROL SUPPORT; ANALYSIS AND INTERPRETATION OF DAC WORKING GROUP RESULTS FOR USE IN PROJECT PLANNING
Peter Klock and Dave Evans Apr. 1979 16 p
(Contract JPL-955231)
(NASA-CR-162331) Avail: NTIS HC A02/MF A01 CSCL 10B

The Executive Summary and Proceedings of the Working Group Meeting was analyzed to identify specific projects appropriate for Distribution Automation and Control DAC RD&D. Specific projects that should be undertaken in the DAC RD&D program were recommended. The projects are presented under broad categories of work selected based on ESC's interpretation of the results of the Working Group Meeting. Some of the projects are noted as utility industry projects. The ESC recommendations regarding program management are presented. Utility versus Government management responsibilities are noted. M.M.M.

N79-34075# Naval Postgraduate School, Monterey, Calif.
DECISION CRITERIA FOR COST-PLUS-AWARD-FEE CONTRACTS IN MAJOR SYSTEMS ACQUISITIONS M.S. Thesis
Gwilym Howard Jenkins, Jr. Mar. 1979 66 p refs
(AD-A070092) Avail: NTIS HC A04/MF A01 CSCL 05/1

The Cost-Plus-Award-Fee contract has useful application in Major Systems Acquisition during the full-scale development phase. This thesis examines the Cost-Plus-Award-Fee contract with Leavitt's Organizational Theory model which identifies goals, technology, people, structure, and environment as factors for analysis. It further investigates cost reimbursement contract types versus technical risk for identification of those criteria, which best accomodate application of the CPAF contract in major systems acquisition. This thesis concludes that the CPAF contract can be viewed as an informal management information system to enhance project control. It summarizes basic strengths and weaknesses of the CPAF contract in major systems acquisitions. GRA

N79-34076# National Technical Information Service, Springfield, Va.
DECISION MAKING IN MANAGEMENT. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1970 - May 1979
Jack Jones Jul. 1979 327 p Supersedes NTIS/PS-78/0605; NTIS/PS-77/0580; NTIS/PS-76/0540; NTIS/PS-75/500 (NTIS/PS-79/0629/0; NTIS/PS-78/0605; NTIS/PS-77/0580; NTIS/PS-76/0540; NTIS/PS-75/500) Avail: NTIS HC $28.00/MF $28.00 CSCL 05A

Research on decision making is cited. Decision making aids and evaluations of criteria used in decision making are included, as are aids to decision making in various industries, research and development, and the military. Decision theoretic models are also covered. This updated bibliography contains 320 abstracts, 35 of which are new entries to the previous edition. GRA

N79-34077# General Accounting Office, Washington, D. C. Financial and General Management Studies Div.
GRANT AUDITING: A MAZE OF INCONSISTENCY, GAPS, AND DUPLICATION THAT NEEDS OVERHAULING
15 Jun. 1979 47 p refs
(PB-296981/4) Avail: NTIS HC A03/MF A01 CSCL 05A

An overhaul of Federal laws, policies, and agency practices

to provide single, coordinated audit coverage of grant recipients is recommended to the Congress and the Office of Management and Budget, as well as to the executive branch which should improve coordination and assure that grant recipients are audited when necessary with results acceptable to all funding agencies. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N79-34078 Pennsylvania State Univ., University Park.
STORAGE ALLOCATION FOR ACCESS PATH MINIMIZATION IN NETWORK-STRUCTURED DATA BASES Ph.D. Thesis
Johann Petur Malmquist 1979 197 p
Avail: Univ. Microfilms Order No. 7922314

A restricted network-structured data base (degree and block size bounded) is defined. The problem of finding an optimal partition for the restricted network-structured data base is shown to be NP-complete. An algorithm for partitioning sparse matrices is analyzed to show that it approximates the optimal partition. Cases of two SET types and two or three record types are introduced and the allocation of record occurrences to physical storage blocks under implementation methods (CHAIN and POINTER-ARRAY) is discussed. For two of the cases introduced the similarities between the partition problem of sparse matrices and the allocation of record occurrences to physical storage blocks when CHAIN implementation is used are shown. Dissert. Abstr.

N79-34079 Ohio State Univ., Columbus.
PERFORMANCE ANALYSIS AND DESIGN METHODOLOGY FOR IMPLEMENTING DATABASE SYSTEMS ON NEW DATABASE MACHINES Ph.D. Thesis
Jayanta Banerjee 1979 301 p
Avail: Univ. Microfilms Order No. 7922448

An analytical study is made of the storage requirement and performance of database machines with respect to those of conventional general-purpose computers. With a realistic choice of database parameters, it is shown that database systems (hierarchical, CODASYL or relational) normally require a slightly increased amount of storage when supported on a database machine. However, the index storage requirement and execution time of user requests are both reduced by as much as one or more orders of magnitude. Dissert. Abstr.

N79-34080 Ohio State Univ., Columbus.
A METHODOLOGY FOR THE PERFORMANCE EVALUATION OF DATA BASE SYSTEMS: AN EXTENSION OF THE IPSS METHODOLOGY, VOLUMES 1 AND 2 Ph.D. Thesis
Joseph Dale Brownsmith 1979 504 p
Avail: Univ. Microfilms Order No. 7922460

The information processing system simulator IPSS/DBS design facility was applied to the analysis of an on-line, real-time application of IDMS, a CODASYL based data base management system. The host-backened computer architecture allowed multiple users on-line access to the data. Several models of the system were prepared and analyzed. Initial results indicate that the methodology and its implementation as IPSS/DES are well suited to the analysis of network-like data base systems. Statistics related to both software and data structure were obtained and were shown to be sensitive to design parameter variations. Dissert. Abstr.

N79-34081 California Univ., Los Angeles.
SEMANTIC INTEGRITY, CONSISTENCY AND CONCURRENCY CONTROL IN DISTRIBUTED DATABASES Ph.D. Thesis
Dusan Zdenek Badal 1979 241 p
Avail: Univ. Microfilms Order No. 7921367

A run time semantic integrity (SI) validation method is proposed and shown to be superior to other validation methods in terms of the cost of data base accesses in centralized data bases and in terms of communication overhead in distributed data bases. Within each SI classification there are several classes of SI assertions that are evaluated at different cost with different delays. Strategies to further decrease the cost and improve the performance of SI validation of transactions are elaborated. In addition, results on the correctness of concurrency control, degree of concurrency, and reliability of concurrency control are derived and proved. A detailed comparative analysis of timestamp and locking based concurrency control approaches leads to the proposal of two concurrency control mechanisms, one being very robust and based on timestamps, and the other having high performance and very low communication overhead. Dissert. Abstr.

N79-34082 This accession not used.

N79-34083# Yale Univ., New Haven, Conn. Dept. of Computer Science.
SKIMMING STORIES IN REAL TIME: AN EXPERIMENT IN INTEGRATED UNDERSTANDING Ph.D. Thesis
Gerald Francis DeJong, II May 1979 238 p refs
(Contract N00014-75-C-1111)
(AD-A071432; RR-158) Avail: NTIS HC A11/MF A01 CSCL 05/2

This dissertation describes a new method of automated text analysis. FRUMP (Fast Reading Understanding and Memory Program) is a working natural language processing system that has been implemented to demonstrate the viability of this new approach. The system skims news stories directly from the United Press International news wire and produces a summary of what it understands. FRUMP is able to correctly process news articles it has never before seen. Author (GRA)

N79-34084# Yale Univ., New Haven, Conn. Dept. of Computer Science.
TEXT PROCESSING EFFECTS AND RECALL MEMORY
Wendy G. Lehnert May 1979 56 p refs
(Contract N00014-75-C-1111)
(AD-A071430; RR-157) Avail: NTIS HC A04/MF A01 CSCL 05/5

One current research area within the field of natural language processing is concerned with the nature of predictive understanding mechanisms that seek to interpret input in terms of knowledge-based expectations. A predictive understanding system (human or computational) builds an internal representation for narratives by generating inferences and making casual connections between the events described on the basis of these expectations. Progress in this area now makes it possible to study the various ways that processing complexity at the time of understanding affects the memory representation generated for a text. This investigation will focus on the design and implementation of process-oriented memory structures in a computer program that understands narratives. The results of these efforts will be of interest to researchers in cognitive psychology and linguistics as well as artificial intelligence. GRA

N79-34085# Ohio State Univ. Research Foundation, Columbus.
A SIMULATION LANGUAGE FOR EVALUATING INFORMATION PROCESSING SYSTEMS FROM A DBMS AND USER PERSPECTIVE: EXTENSIONS TO THE INFORMATION PROCESSING SYSTEM SIMULATOR Final Report, 1 Aug. 1977 - 31 Jan. 1978
Thomas G. Delutis 1 Sep. 1978 269 p refs
(Grant DAAG29-77-G-0203)
(AD-A069543; ARO-15356.1-A-M) Avail: NTIS HC A12/MF A01 CSCL 09/4

The process of analyzing and designing contemporary information systems is a complex one. Models of proposed system designs can be extremely helpful in determining their behavior prior to the expenditure of manpower, dollars and time on unsatisfactorily performing systems. The goal of this research was to investigate simulation methodologies and language capabilities which could ease model synthesis and analysis efforts in support of system analysis and design. This research focused specifically on data base subsystems and on satisfaction of user performance requirements. An integral part of the research was the modeling of a complex information system architecture to test the appropriateness of the information processing system simulator design facility (IPSS) as a design tool. This document describes the investigative and modeling efforts and reports on the following conclusions: IPSS is a useful tool for modeling in a topdown, modular manner complex information system architectures, and the proposed new capabilities would significantly reduce modeling efforts. GRA

N79-34086# Purdue Univ., Lafayette, Ind. Center for Information and Numerical Data Analysis and Synthesis.
THERMOPHYSICAL AND ELECTRONIC PROPERTIES INFORMATION ANALYSIS CENTER (TEPIAC): A CONTINUING SYSTEMATIC PROGRAM ON DATA TABLES OF THERMOPHYSICAL AND ELECTRONIC PROPERTIES OF MATERIALS Final Report, 1 Jan. 1977 - 31 Dec. 1978
Cho-Yen Ho Mar. 1979 94 p refs
(Contract DSA900-77-C-3758)
(AD-A071240; AMMRC-TR-79-21) Avail: NTIS HC A05/MF A01 CSCL 05/2

The objective of TEPIAC operations is to increase the productivity of scientists, engineers, and technicians engaged in scientific and engineering programs for the Department of Defense by maintaining a comprehensive, authoritative, and up-to-date national data base on thermophysical and electronic (including also electrical, magnetic, and optical) properties of materials for use by the entire DOD community and by providing authoritative data and information analysis services. Its major functions are to search, collect, review, evaluate, appraise, analyze, synthesize, and summarize the available scientific and technical data and information from worldwide sources on the various thermophysical, electronic, electrical, magnetic, and optical properties of materials and to disseminate the results both by providing authoritative data and information directly to the individual users through technical and bibliographic inquiry services and by publishing major reference works on property data and information for the general users at large. GRA

N79-34087# RAND Corp., Santa Monica, Calif.
AN INTRODUCTION TO THE ISIS INTERACTIVE INFORMATION SYSTEM
Herbert J. Shukiar, Charles H. Bush, and Robert C. Gammill Apr. 1979 103 p
(Contract F49620-77-C-0023)
(AD-A071005; RAND/R-2435-AF) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report describes in a tutorial manner ISIS, an interactive data base management system developed on the PDP11 computer under the UNIX timesharing system. ISIS, designed for computer-naive users, uses an English-like command language to give the user the ability to view, modify, and otherwise reorganize his data base. ISIS operates on data bases of modest size, exploiting the unique characteristics associated with such data bases. The tutorial focus is tactical command and control, but ISIS is more generally applicable. The report introduces the ISIS command language in stages, and the user with access to Rand's PDP11/70 can try ISIS out on the command and control data base utilized in the report. The report also discusses the system development philosophy adopted during ISIS implementation. GRA

N79-34088# California Univ., Livermore. Lawrence Livermore Lab.
SCIENTIFIC APPLICATION CODING IN THE CONTEXT OF DATAFLOW
John P. Woodruff 15 Nov. 1978 11 p refs Presented at Natl. Computer Conf., N. Y., 4 - 7 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-81922; Conf-790614-1) Avail: NTIS HC A02/MF A01

The type of computation that is carried out in support of applied physics research is described with particular emphasis on the data dependencies that exist in both explicit and implicit finite difference equations. The features of these application codes that determine the scale of the computation to be performed are described, and present codes running on available computers are observed to be smaller scale solutions than ideal physical modelling would require. Before programs can be written for a hypothetical dataflow computer, several programming techniques need to be developed. These techniques are embodied in the programming languages and the data types that are used to express a program. Imperative and application language styles are described and compared to the semantic basis of a dataflow computer. Data types that are used in conventional computer codes are examined, and certain shortcomings relative to dataflow computing are noted. DOE

N79-34089# National Science Foundation, Washington, D. C. Div. of Information Science and Technology.
INFORMATION THROUGH THE PRINTED WORD: THE DISSEMINATION OF SCHOLARLY, SCIENTIFIC, AND INTELLECTUAL KNOWLEDGE
Fritz Machlup and Kenneth Leeson 1979 9 p
(PB-296730/5) Avail: NTIS HC A02/MF A01 CSCL 05B

The dissemination of scholarly (scientific, technical, intellectual) knowledge through primary and secondary publications, chiefly books, journals and other materials is reported. This fact-finding study is designed to throw light on the economic condition of publishing and library operations. GRA

N79-34090# National Oceanic and Atmospheric Administration, Rockville, Md. Library and Information Services Div.
SCIENCE FOR THE PHYSICALLY HANDICAPPED IN HIGHER EDUCATION: A GUIDE TO SOURCES OF INFORMATION
Gary H. Adams Apr. 1979 39 p
(PB-297382/4; NOAA-79061204) Avail: NTIS HC A03/MF A01 CSCL 05B

The sources found in the guide provide information to educators, administrators, researchers, and businesses seeking ways to implement science education and career programs in their establishments, as well as to potential scientists and engineers who have a physical handicap and need information about programs, career opportunities, and educational funding sources. GRA

N79-34091# Oklahoma State Legislative Council, Oklahoma City.
DEVELOPMENT OF A SCIENCE AND TECHNOLOGY INFORMATION SYSTEM
James H. Johnson and Lee Ivy Mar. 1979 106 p ref
(Grant NSF ISP-77-25887)
(PB-297592/8) Avail: NTIS HC A06/MF A01 CSCL 05B

The activities of the Oklahoma Legislative Council to establish capabilities in the area of systematic transfer of scientific and technical information are described. Oklahoma is one of 42 states involved in the State, Science, Engineering, and Technology (SSET) program initiated to provide state policymakers with much of the best technical information possible to be used in the decision making process. The survey technique is used to obtain evaluations from a random sample of the legislature to assess its evaluation of the information resources available to them. Both needs and resource assessments are presented and include a series of models describing several types of information for the purpose of evaluation, a resource directory, flow charts, and an organizational chart. Questionnaires for needs assessment and resource assessment are contained in the appendices. GRA

N79-34092# American Geological Inst., Falls Church, Va.
DESIGN OF AN EXPERIMENTAL COOPERATIVE NETWORK FOR SHARING INFORMATION AND DATA RESOURCES IN GEOLOGY Final Report, 1 Oct. 1977 - 31 Mar. 1979
Dec. 1978 156 p refs
(Grant NSF DSI-77-07829)
(PB-296286/8) Avail: NTIS HC A07/MF A01 CSCL 09B

A network to provide information services through computer terminals linked by telephone to the State Geological Surveys is described. The participating Surveys would control and fund the network. Initially its capabilities would be modest, limited to a few clearly-defined functions and requiring less than a full time person in each Survey. Five Surveys were visited to learn first hand their network-related needs. The technologies of networking, teleconferencing, and telefacsimile were examined in relation to the needs. State-of-the-art reports on these technologies are contained. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N79-34093*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE ECONOMICS OF PROJECT ANALYSIS: OPTIMAL INVESTMENT CRITERIA AND METHODS OF STUDY
Marc C. Scriven (Alabama Univ., Huntsville) Sep. 1979 32 p refs
(NASA-TM-78242) Avail: NTIS HC A03/MF A01 CSCL 05C

Insight is provided toward the development of an optimal program for investment analysis of project proposals offering commercial potential and its components. This involves a critique of economic investment criteria viewed in relation to requirements of engineering economy analysis. An outline for a systems approach to project analysis is given Application of the Leontief input-output methodology to analysis of projects involving multiple processes and products is investigated. Effective application of elements of neoclassical economic theory to investment analysis of project components is demonstrated. Patterns of both static and dynamic activity levels are incorporated. A.R.H.

N79-34094*# ORI, Inc., Bethesda, Md.
WORLD HELICOPTER MARKET STUDY
B. Cleary, R. W. Pearson, S. W. Greenwood, and L. Kaplan 3 Jul. 1978 170 p refs
(Contract NASw-2961)
(NASA-CR-163091; TR-1342) Avail: NTIS HC A08/MF A01 CSCL 05C

The extent of the threat to the US helicopter industry posed by a determined effort by foreign manufacturers, European companies in particular, to supply their own domestic markets and also to penetrate export markets, including the USA is assessed. Available data on US and world markets for civil and military uses are collated and presented in both graphic and tabular form showing the past history of production and markets and, where forecasts are available, anticipated future trends. The data are discussed on an item-by-item basis and inferences are drawn in as much depth as appears justified. A.R.H.

N79-34095# Dynamic Sciences International, Sepulveda, Calif.
TEST PROGRAM SET COST ALGORITHM Final Report, 21 Sep. 1977 - Apr. 1978
D. James Zingg, Al V. Robertson, and Dave McIntyre May 1979 69 p
(Contract DAAB07-77-C-2727; DA Proj. 1I7-62779-AH-62)
(AD-A070629; CORADCOM-77-2727-F-1) Avail: NTIS HC A04/MF A01 CSCL 14/2

The Test Program Set Cost Algorithm provides a methodology for identifying and quantifying the funding costs of major tasks in Test Program Sets (TPS's) development. Areas that are addressed by the study include the learning curve effect, impact of ATE maturity, impact of UUT (Unit Under Test) Testability, effect of design guides on development and life-cycle costs, management-controlled cost factors, utilization of Automatic Test Program Generation (ATPG), development costs vs. life-cycle costs, fault insertion and customer 'sell-off', and commercial vs. military support. The basic algorithm deals with the analysis, coding, checkout and sell-off of a test program set but other factors such as overhead support, interface device design, ATE compatibility, etc., are discussed. The application and usage of the algorithm should provide a valuable estimating tool to assess costs associated with Test Program Set development. GRA

N79-34096# Princeton Univ., N. J. Center for New Jersey Affairs.
MOBILIZING CAPITAL FOR ECONOMIC DEVELOPMENT: INSTITUTIONAL INNOVATION AND THE NEW URBAN POLICY Final Report
Peter J. Bearse Aug. 1978 393 p refs Conf. held at Princeton, N. J., 27 Apr. 1978
(Grant EDA-PF-638)
(PB-294399/1; EDA/OER-79/054) Avail: NTIS HC A17/MF A01 CSCL 05C

The role of capital in the economic problems of the Northeastern cities is discussed. The stimulation of capital mobilization through government policies is studied. Institutional innovations at the state level which are designed to foster the commercial exploitation of technology is examined. Capital, social objectives, new urban policy, and the design of development finance institutions are evaluated. A.W.H.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N79-34097# Life Systems, Inc., Cleveland, Ohio.
EVALUATION OF AN ELECTROCHEMICAL BIOCIDE Final Report, Jun. 1974 - Nov. 1978
J. B. Lantz and K. A. Burke Nov. 1978 83 p refs
(Contract DAMD17-74-C-4102; DA Proj. 3E7-62720-A-835)
(AD-A071109; LSI-ER-289-5) Avail: NTIS HC A05/MF A01 CSCL 13/2

An alternate disinfecting process to chemical agents, heat and radiation in an aqueous media has been studied. The process is called an Electrochemical Biocide and employs cyclic, low level voltages at chemically-inert electrodes to pass alternating current through water and, in the process, destroy microorganisms present. The results of continuing development efforts are reported. The process was shown to be effective against two disinfection resistant microorganisms. flow-past electrodes were shown to be fouling-resistant, and the process was additionally characterized for effects of power parameters, operating modes and membrane isolation of the electrode surface. Flow-through reactors were developed and tested, showing that superior mass transport of microorganisms was achieved at low concentrations. Continuous single-pass processing was demonstrated with a newly-developed multiple cell, flow-through Electrochemical Biocide module, a special continuous culture test stand and a new extended range power supply. An economic analysis and cost comparison study showed that the Electrochemical Biocide could be cost competitive for disinfection of low volume wastewater sources. GRA

N79-34098# Economics, Statistics and Cooperatives Service, Washington, D. C. Economic Development Div.
REGIONAL MANUFACTURING EMPLOYMENT GROWTH PATTERNS Final Report
M. F. Petrulis Jun. 1979 47 p refs
(PB-296998/8; RDRR-13) Avail: NTIS HC A03/MF A01 CSCL 05C

Two patterns in U. S. industrial job growth are discussed. The movement from metropolitan to nonmetropolitan areas and the general increase in national employment at the expense of the nation's Northeast and Midwest which had shifts to the South and West are studied. The employment growth patterns in 21 manufacturing industries from 1967 to 1973 are described. Employment growth trends are summarized in a shift and share framework. The factors which relate to the differences in the rates of employment growth among metro and nonmetro areas are analyzed. A.W.H.

N79-34099# RAND Corp., Santa Monica, Calif.
THE CHANGING DEMOGRAPHIC AND ECONOMIC STRUCTURE OF NONMETROPOLITAN AREAS IN THE UNITED STATES Final Report
Kevin F. McCarthy and Peter A. Morrison Jan. 1979 75 p refs
(Grant EDA/OER-513-G-76-5)
(PB-297540/7; R-2399-EDA; ISBN-0-8330-0102-7; EDA/OER-79/053; LC-79-4203) Avail: NTIS HC A04/MF A01 CSCL 05C

Recent demographic trends and the economic consequences of such trends in the nonmetropolitan sector in the U.S. are assessed. It differentiates changing demographic patterns and the influence affecting these patterns in the nonmetropolitan sector. Three recent trends contribute to increase nonmetropolitan population growth; increasing accessibility to the national metropolitan economy, new industrial activity in the nonmetropolitan sector, and a changing American lifestyle. Retirement and recreation have increased in importance as sources of population growth in the nonmetropolitan sector. Economic factors may no longer provide the dominant impetus to nonmetropolitan growth. GRA

N79-34100# National Technical Information Service, Springfield, Va. Developing Country Staff.
GLOBAL LISTING OF APPROPRIATE TECHNOLOGY ORGANIZATIONS AND SOURCES
Paul Bundick 1979 169 p Sponsored in part by Agency for International Development
(PB-296635/6) Avail: NTIS HC A04/MF A01 CSCL 05B

This directory is a comprehensive listing of addresses of worldwide organizations, research institutes, and development groups involved in some aspect of appropriate technology. The list compiled in 1978 from numerous sources, is organized alphabetically by region, country, and organization. The United States is arranged according to states. GRA

N79-34101# National Bureau of Standards, Washington, D. C. Office of International Relations.
THE TECHNICAL KNOWLEDGE BASE FOR INDUSTRIALIZING COUNTRIES: PROCEEDINGS OF THE NBS/AID UNCSTD (UNITED NATIONS CONFERENCE ON SCIENCE AND TECHNOLOGY FOR DEVELOPMENT) Final Report
Raymond C. Sangster, ed. Apr. 1979 241 p refs Seminar held at Gaithersburg, Md., 16-17 Oct. 1978 Sponsored in part by US Coordinator for the UN Conference on Science and Technology for Development, and Agency for International Development, Washington, D.C.
(Grant PASA-TA(CE)-6-71)
(PB-294984/0; NBS-SP-543; LC-79-600058) Avail: NTIS HC A11/MF A01 CSCL 05B

The establishment of a technological knowledge base for industrializing countries is discussed. The areas covered include measurement capabilities and services required by technological industry, national and international standards required by industrializing nations, acquisition of commercial industrial technology, and industrial quality control. GRA

N79-34102# Environmental Monitoring and Support Lab., Cincinnati, Ohio.
HANDBOOK FOR ANALYTICAL QUALITY CONTROL IN WATER AND WASTEWATER LABORATORIES Final Report
Robert L. Booth Mar. 1979 157 p
(PB-297451/7; EPA-600/4-79-019) Avail: NTIS HC A08/MF A01 CSCL 13B

The quality control (QC) for chemical and biological tests and measurements is considered. QC aspects of sampling, microbiology, biology, radiochemistry, and safety as they relate to water and wastewater pollution control are reported. Sufficient information is offered to allow the reader to inaugurate or reinforce programs of analytical QC that emphasize early recognition, prevention, and correction of factors leading to breakdowns in the validity of water and wastewater pollution control data. GRA

N79-34103# General Accounting Office, Washington, D. C. Community and Economic Development Div.
WATER SUPPLY FOR URBAN AREAS: PROBLEMS IN MEETING FUTURE DEMAND Report to the Congress
15 Jun. 1979 61 p
(PB-296973; CED-79-56) Avail: NTIS HC A04/MF A01 CSCL 13B

The quantity of surface and ground water, water quality, distribution systems, and institutional and legal constraints are factors in urban problems related to water supply and demand. Fourteen American cities were surveyed to determine methods for assuring an adequate supply by the year 2000. Topics discussed include desalination, conservation, and demand reduction. GRA

N79-34104# United Nations Industrial Development Organization, Vienna (Austria).
TECHNOLOGIES FROM DEVELOPING COUNTRIES: DEVELOPMENT AND TRANSFER OF TECHNOLOGY SERIES, NO. 7
1978 46 p Sponsored in part by Agency for International Development, Wash., D.C.
(PB-296574/7) Avail: NTIS HC A03/MF A01 CSCL 13H

Information on 138 technologies from developing countries is provided. Under each heading a brief description of the technology and its distinctive features are given. Heading technologies include plants and plant products; animal products; food industry; leather; wood, pulp, and paper; textiles; energy; chemical; plastics; construction; metals; and machinery. GRA

N79-34105# Gurnham and Associates, Inc., Chicago, Ill.
CONTROL OF HEAVY METAL CONTENT OF MUNICIPAL WASTEWATER SLUDGE
C. Fred Gurnham, Betty A. Rose, H. Russell Ritchie, William T. Fetherston, and Andrew W. Smith Apr. 1979 153 p refs
(Grant NSF ENV-77-04355)
(PB-295917/9; NSF/RA-790065) Avail: NTIS HC A08/MF A01 CSCL 13B

The concentrations of heavy metals in sewages, particularly residential sewages, are studied. The concentrations of heavy metals in various commodities used in a typical household, including foods and the water supply, are analyzed. Seven specific metals are examined in the waste waters from two residential areas. These are cadmium, mercury, zinc, nickel, chromium, copper, and lead. The concentrations are reported. A material balance equation for each of the seven heavy metals, using estimated quantities consumed of the analyzed commodities, was developed to correlate the total input of heavy metals into a residence with the total output. A.W.H.

N79-34106# Harvard Univ., Cambridge, Mass. Landscape Architecture Research Office.
THE INTERACTION BETWEEN URBANIZATION AND LAND QUALITY AND QUANTITY IN ENVIRONMENTAL PLANNING AND DESIGN, THE PUBLIC EXPENDITURE MODEL. TECHNICAL DOCUMENTATION
John Kirlin and H. James Brown Jan. 1979 92 p refs
(Grant NSF ENV-72-03372)
(PB-294715/8; NSF/RA-780421) Avail: NTIS HC A05/MF A01 CSCL 13B

The impact of land use change upon public local expenditures was investigated. The public expenditure model simulates local

fiscal decision making and estimates operating expenditures and capital outlays for a number of separate local public service categories. The model accepts information about changes in ppopulation, employment, and the demographic characteristics of the town from the various allocation models. This information, combined with a variety of descriptive information about the town at the beginning of the iteration, provides the basis for public decisions about the size and composition of the local budget. These budgetary decisions serve as inputs to public allocative models such as schools and local conservation. GRA

N79-34107# Delaware Univ., Newark. Dept. of Civil Engineering.
PROCESS SELECTION FOR OPTIMAL MANAGEMENT OF REGIONAL WASTEWATER RESIDUALS Final Report
Richard I. Dick, David L. Simmons, Roy O. Ball, Kim Perlin, and Michael W. OHara Aug. 1978 502 p refs
(Grant NSF ENV-75-15751)
(PB-295950/0; NSF/RA-780488) Avail: NTIS HC A22/MF A01 CSCL 13B

The development of a framework for optimal integration of processes involved in the treatment, reclamation, and disposal of sludges from municipal wastewater plants is described. A mathematical approach was employed which describes the performance and cost of sludge treatment processes as functions of basic design and operational variables. A digital computer was used to identify the optimum manner for combining processes based on the mathematical descriptions of the performance and cost of each component of overall sludge management schemes. GRA

N79-34108# Illinois State Water Survey, Urbana.
IMPACT OF WASTES FROM A WATER TREATMENT PLANT: EVALUATING PROCEDURES AND RESULTS
Ralph L. Evans and Donald H. Schnepper 1979 44 p refs Prepared in cooperation with Ill. Inst. of Natural Resources, Chicago
(PB-296040/9; ISWS/CIR-135/79; W79-06889) Avail: NTIS HC A03/MF A01 CSCL 13B

The effects on a stream in Illinois of waste discharges from a water treatment plant that employs the clarification process were assessed. Topics discussed include the water treatment plant, the chemical characteristics of the stream, and the biological characteristics of the stream. This capability is a function of stream geometry, flow, upstream water quality, and the characteristics and magnitude of the waste load. GRA

N79-34109# California State Div. of Mass Transportation, Sacramento.
PERFORMANCE MEASURES FOR PUBLIC TRANSIT SERVICE Final Report
Ernest Fuller, Jr. Dec. 1978 115 p refs
(Grant UMTA-CA-09-8001)
(PB-294955/0; DMT-033; UMTA-CA-09-8001-79-1) Avail: NTIS HC A06/MF A01 CSCL 13B

Definitional, institutional, and technical difficulties associated with developing Transit Performance Measures (TPM's) are identified for use in evaluating public transit service. A survey is made of contemporary evaluation processes and is evaluated in terms of their purpose. The procedures used by the Division of Mass Transportation of the California Department of Transportation in developing its list of TPM's is described, as well as suggested methods for developing performance standards. The necessity for linking TPM's to funding strategies is also discussed. Further refinement and verification of the research methodology used in this research project is needed. It is pointed out that if public transit service evaluation can be developed effectively, it will greatly enhance the efficiency and effectiveness of public transit service. GRA

N79-34110# Voorhees (Alan M.) and Associates, Inc., McLean, Va.
TSM (TRANSPORTATION SYSTEM MANAGEMENT): AN ASSESSMENT OF IMPACTS
Fred A. Wagner, Keith Gilbert, Steven Shapiro, James E. Watt, and William S. Herald Nov. 1978 188 p refs
(PB-294986/5; UMTA-VA-06-0047-79-1) Avail: NTIS HC A09/MF A01 CSCL 13B

Urban areas with populations greater than 50,000 are required to develop TSM plans that document their strategy for improving air quality, conserving energy, and increasing the efficiency of the overall transportation system. Interim results of research designed to quantify the impacts of TSM actions on the system are summarized. Working papers are included which describe experience with and the impacts of ridesharing, routes and scheduling, Park-and-Ride and express bus, work rescheduling, and auto restricted zones. GRA

N79-34111# Intermediate Technology Development Group, London (England).
TECHNOLOGY FOR A CHANGING WORLD
Roger England, comp. and John Davis 1978 66 p
(PB-297378/2; ISBN-0-903031-56-6) Avail: NTIS MF A01 CSCL 05C

The application of the concepts of appropriate technology to the economy is considered with recognition of the fact that rich and poor countries alike stand in need of a new kind of technology which is more in harmony with people and with the environment. Subject areas include the appropriateness of conventional technology; productivity; energy; small enterprises; local enterprise trusts; education for a new world; and the right to choose technologies. GRA

N79-34112# New York City Dept. of Water Resources, N. Y.
DUAL PROCESS HIGH-RATE FILTRATION OF RAW SANITARY SEWAGE AND COMBINED SEWAGE OVERFLOWS Final Report, 1 Jun. 1975 - 30 Jun. 1977
Hank Innerfeld, Angelika Forndran, Dominick D. Ruggiero, and Thomas J. Hartman Mar. 1979 117 p refs
(Grant EPA-S-803271)
(PB-296626/5; EPA-600/2-79-015) Avail: NTIS HC A06/MF A01 CSCL 13B

The suspended solids removal capabilities of the deep bed, high rate gravity filtration process on raw sewage and combined sewer overflows are studied. The filter column contains anthracite over sand and is preceded by a rotary screening unit equipped with a screen to remove grit, fibers and other coarse material. The filter was evaluated both with and without the use of chemical additives. The filtration systems performance in industrial waste water treatment is discussed and comparisons are made with plants currently in operation. A.W.H.

N79-34113# Massachusetts Inst. of Tech., Cambridge. Lab. for Water Resources and Hydrodynamics.
A DYNAMIC NUTRIENT CYCLE MODEL FOR WASTE STABILIZATION PONDS Final Report, Nov. 1976 - Apr. 1979
Raymond A. Ferrara and Donald R. F. Harleman Dec. 1978 351 p refs
(Grant NSF ENG-76-06491)
(PB-295660/5; R78-43; NSF/ENG-76-06491) Avail: NTIS HC A16/MF A01 CSCL 13B

Due to their dynamic nature, there is a critical need for a reliable, predictive method for the design and analysis of stabilization ponds that goes beyond the classical BOD approach and considers biological and nutrient dynamics. Existing hydraulic models are evaluated and an improved dispersion model characterized by an active flow zone and a return flow zone is developed and verified. It is shown that it is appropriate to assume fully mixed conditions for most existing unbaffled ponds. A biogeochemical model containing nine state variables describing the transformations of three elements - carbon, nitrogen, and phosphorus - is developed. The model reflects the cycling of elements between organic and inorganic forms and is capable of predicting oxygen demand, fecal coliform, nitrogen, and phosphorus concentrations on a time-variable basis. GRA

N79-34114# Kerr (Robert S.) Environmental Research Lab., Ada, Okla. Office of Research and Development.
MANUAL OF PRACTICE: THE DISPOSAL OF COMBINED MUNICIPAL/INDUSTRIAL WASTEWATER RESIDUES (METALS) Final Report
Hugh M. Jeffus Feb. 1979 39 p refs
(PB-295637/3; EPA-600/2-79-052) Avail: NTIS HC A03/MF A01 CSCL 13B

The processes and products of the different metals used in

municipal/industrial areas are discussed. The potential sources of metals in combined wastewater residues are identified along with the potential problems in the disposal of these residues. Disposal practices, incineration, landspreading, landfilling, and encapsulation are discussed. Limiting concentrations of potential problem metals are given for incineration and landspreading.
GRA

N79-34115# American Society of Civil Engineers, New York.
PROCEEDINGS: WORKSHOP TOWARD AN OXYGEN TRANSFER STANDARD
William C. Boyle, ed. (Wisconsin Univ.-Madison) Apr. 1979 284 p refs Workshop held at Pacific Grove, Calif., 11-14 Apr. 1978
(Grant EPA-R-805868)
(PB-296557/2; EPA-600/9-78-021) Avail: NTIS HC A05/MF A01 CSCL 07D

Historical practices and current art in the testing and evaluation of oxygen transfer devices used in the treatment of wastewater are summarized in an attempt to develop a tentative interim oxygen transfer standard on research grant project. Experts in the field of oxygen transfer were brought together to: identify areas of agreement and disagreement in the evaluation of oxygen transfer devices and identify research needs in the development of an effective consensus standard for oxygen transfer devices.
GRA

N79-34116# Energy Resources Co., Inc., Cambridge, Mass.
HEALTH AND LEGAL IMPLICATIONS OF SEWAGE SLUDGE COMPOSTING. VOLUME 1: WORKSHOP REPORT. VOLUME 2: POSITION PAPERS
Jan Connery, Eliot Epstein, Frederick Guymont, Steven Marcus, Frederick Passman, Joe Post, and William Taffel Feb. 1979 449 p refs Conf. held at Cambridge, Mass., 18-20 Dec. 1978
(Grant NSF PFR-78-15878)
(PB-296566/3; NSF/RA-790045-Vol-1/2) Avail: NTIS HC A19/MF A01 CSCL 06F

The pathogenic health risks associated with the production, distribution, and the use of composted sewage sludge are analyzed and legal, institutional, and engineering measures to minimize such risks are recommended in nine position papers which address these issues.
GRA

N79-34117# Midwest Research Inst., Kansas City, Mo.
TECHNOLOGY ASSESSMENT IN THE PRIVATE SECTOR: AN EXPLORATORY STUDY
James D. Maloney, Jr., Mary Simister, and Daniel Keyes 30 Nov. 1978 228 p refs
(Grant NSF ERS-77-13028)
(PB-297047/3; NSF/PRA-7713028) Avail: NTIS HC A11/MF A01 CSCL 05A

The limitations of past studies undertaken to investigate the relationship of technology assessment to private sector planning are examined and the need for additional research is discussed. Objectives and hypotheses of the study were translated into survey questions and the methodology for the sample selection and survey administration is presented. Industrial technology assessment is defined and differentiated from other types of assessment efforts in the private sector. The quantitative results of the survey and their relationships to the research questions/hypotheses/objectives are reviewed.
GRA

88 SPACE SCIENCES (GENERAL)

N79-34118*# National Aeronautics and Space Administration, Washington, D. C.
SKYLAB'S ASTRONOMY AND SPACE SCIENCES
Charles A. Lundquist, ed. 1979 126 p Original contains color illustrations
(NASA-SP-404) Avail: NTIS MF A01; SOD HC CSCL 03A

The capabilities of Skylab for multidisciplinary investigations are reviewed. Experiments and results are discussed for observations of stars and galaxies, energetic particles, interplanetary dust, Comet Kohoutek, the earth's atmosphere, and the nature and effects of space environments on man. For individual titles, see N79-34119 through N79-34125.

N79-34119*# National Aeronautics and Space Administration, Washington, D. C.
INTRODUCTION TO SKYLAB **c18**
In its Skylab's Astron. and Space Sci. 1979 p 1-6 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 22B

The general characteristics of the Skylab space station are reviewed as well as its mission sequence, orbits, and ground trace and tracking stations. Special accommodations and equipment used for X-ray and UV observations of zodaical light, atmospheric glow, stars and galaxies, the Comet Kohoutek, and primary cosmic particles are described. Methods for measuring particles in the Van Allen Belts and materials emanating from the spacecraft itself are also discussed.
A.R.H.

N79-34120*# National Aeronautics and Space Administration, Washington, D. C.
STELLAR AND GALACTIC ASTRONOMY **c89**
In its Skylab's Astron. and Space Sci. 1979 p 7-26 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03A

The importance of the ultraviolet region to astrophysics is reviewed. The instrumentation and operating modes of experiment S019 designed to obtain widened spectra of 188 star fields covering an area approximately 3660 square degrees are described. The problem of attenuation of UV light by interstellar dust is addressed and the spectra of Wolf-Rayet and hot stars are examined. The far-ultraviolet electrographic camera used in experiment S201 to observe Comet Kohoutek, the Gum Nebula, the Pleiades, and the small Magellanic clouds is described as well as the isophotes constructed. The ultraviolet panorama experiment (S183) to obtain UV intensities, at three wavelengths of hot stars, star clusters, and large stellas clouds in the Milky Way and nuclei of other galaxies is also described. The Schmidt-Cassegrain camera system used and the photometer and camera results obtained are discussed. The S150 experiment to map galactic X-ray emissions using an instrument carried on the Saturn 1B rocket orbiting below and behind Skylab is also included.
A.R.H.

N79-34121*# National Aeronautics and Space Administration, Washington, D. C.
INTERPLANETARY DUST **c90**
In its Skylab's Astron. and Space Sci. 1979 p 27-42 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03B

The micrometeoroid collection experiment (S149) mounted in two different locations on Skylab is described. Impact craters, meteoroid residue, and the 'evil eye' holes penetrating the nitrocellulose films are discussed. Results obtained by the photomultiplier photometer used to measure gegenschein-zodiacal light (S073) in the hemisphere of the sky centered in the antisolar direction are examined. The Poynting-Robertson effect, the brightness and polarization of the skyglow, and the lunar libration regions are considered.
A.R.H.

N79-34122*# National Aeronautics and Space Administration, Washington, D. C.
OBSERVATIONS OF COMET KOHOUTEK **c91**
In its Skylab's Astron. and Space Sci. 1979 p 43-64 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03B

Comet Kohoutek (1973 XII) was discovered by Lubos Kohoutek during a search for asteroid images on photographic plates taken in early March 1973. Calculations of its size and orbit showed it to be a large comet that would pass close to the Sun, reaching periphelion at the end of 1973. The National Aeronautics and Space Administration was prompted to initiate Operation Kohoutek, a program to coordinate wide-spread observations of the comet from ground observatories, aircraft, balloons, rockets, unmanned satellites and Skylab. The results of some of these observations are presented through photographs, illustrations and graphs.
G.Y.

N79-34123*# National Aeronautics and Space Administration, Washington, D. C.
ENERGETIC PARTICLES c93
In its Skylab's Astron. and Space Sci. 1979 p 65-78 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03B

The particles within the magnetosphere have various origins and some have complex histories. Among those observed by instruments on Skylab were galactic cosmic rays, trapped particles probably originating in the solar wind, and neutrons formed by the reaction of high-energy particles with the atmosphere. In addition, there were secondary particles produced by high-energy particles striking the structure of Skylab itself. Skylab's orbit was entirely within the magnetosphere. G.Y.

N79-34124*# National Aeronautics and Space Administration, Washington, D. C.
THE EARTH'S ATMOSPHERE c46
In its Skylab's Astron. and Space Sci. 1979 p 79-92 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 04A

The earth's atmosphere was studied from the ground and from various vehicles. Skylab's position above the atmosphere and the long duration of the mission enabled the crews to gather information about the atmosphere that could hardly be obtained in any other way. Photographic observations of the sunrise, the moonrise, the horizon, the ionosphere, the earth's limb in ultraviolet and the aurora are presented. Data obtained from spectral line absorption analysis is also presented. G.Y.

N79-34125*# National Aeronautics and Space Administration, Washington, D. C.
ORBITAL ENVIRONMENT c18
In its Skylab's Astron. and Space Sci. 1979 p 93-115 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 22B

Discussion on the following Skylab exeriments are presented: contamination and measuring instruments; thermal control coatings; effects of the space environment on materials; optical surfaces; contamination effects on metallic foils; the optical environment; oxidation; inside atmosphere; radiation; Van Allen Belt dosimeters; and radiation effects on films. G.Y.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N79-34126 New Mexico State Univ., University Park.
A PHOTOMETRIC INVESTIGATION OF THE COLORS, SHAPES AND SPIN RATES OF HIRAYAMA FAMILY ASTEROIDS Ph.D. Thesis
Edward Francis Tedesco 1979 301 p
Avail: Univ. Microfilms Order No. 7922203

Results of photometric lightcurve and UBV observations of Hirayama family and field asteroids are presented. Field asteroids (i.e., non-family members) were examined independently to establish a control group. Dissert. Abstr.

N79-34127 California Inst. of Tech., Pasadena.
X-RAY OBSERVATIONS OF DWARF NOVAE Ph.D. Thesis
France Anne-Dominic deCordova 1979 274 p
Avail: Univ. Microfilms Order No. 7919849

The detection by HEAO-1 of pulsed soft X-rays (0.1 - 0.5 keV) with a period of 9 s and a pulsed fraction that varies between 0 and 100% from SS Cygni at the peak of an optical outburst confirms for the first time the supposed high-energy origin of the optical pulsations seen from dwarf novae. The pulse shape is remarkably sinusoidal for such a large amplitude oscillation. A soft X-ray pulsation detected from U Geminorum on the declining portion of an optical outburst is quasi-periodic with periods ranging from 20 to 30 s, and present throughout all binary phases with an average amplitude of approximately 15%. A preliminary survey of the soft X-ray emission from approximately 65 dwarf novae during quiescence was also made. Thus far, soft X-rays were detected only at positions coincident with those of AY Lyrae and EX Hydrae. The quiescent state spectra of dwarf novae are compared with their outburst spectra. It is concluded that variations in the mass accretion rate may account for the variety of X-ray behavior observed. Dissert. Abstr.

N79-34128 Texas Univ. at Austin.
GALAXY POPULATION ANALYSIS Ph.D. Thesis
Malcolm James MacFarlane 1979 256 p
Avail: Univ. Microfilms Order No. 7920162

Continuous spectrum scans were applied to the problem of galaxy population analysis. Synthetic spectra were matched objectively to observed spectra by a modified least squares technique with linear side constraints. The spectrum scans which are sampled uniformly every 10 A, without recourse to a fictitious continuum against which to measure equivalent widths. Observations of the nuclear regions of M31 and M32 indicate that the light is dominated by late-type, evolved stars with strong lines. Since the scans yield accurate line strength measures, the main sequence turnoff and the average metallicity can be determined with some precision. The model building technique is the sensitivity of the solutions to small perturbations is discussed. Extension of the observations to the 1 micron region should allow the determination of the slope of the mass function which is essential for galaxy evolution studies. Dissert. Abstr.

N79-34129*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
GRAZING INCIDENCE IMAGING TELESCOPE FOR X-RAY ASTRONOMY USING SOUNDING ROCKETS Final Report, 1 Jan. 1976 - 31 Jan. 1979
Sep. 1979 19 p
(Grant NsG-5091)
(NASA-CR-162356) Avail: NTIS HC A02/MF A01 CSCL 03A

A sounding rocket flight to image a point X-ray source and to determine the detector background characteristics in a space environment is evaluated. The verification of the HRI detector design in a flight environment is described. The environmental factors, including ambient neutral and charged particle densities, the electromagnetic radiation field, and the vibration and acceleration induced at launch, that affect the operations of the HRI are discussed. A.W.H.

N79-34130*# California Inst. of Tech., Pasadena.
SUPPORT FOR JOINT INFRARED AND COPERNICUS X-RAY OBSERVATIONS OF CYGNUS X-3 Final Report
26 Oct. 1979 14 p ref
(Grant NsG-5208)
(NASA-CR-162357) Avail: NTIS HC A02/MF A01 CSCL 03A

Simultaneous X-ray and infrared measurements were carried out of the flares from Cygnus X-3 from the Copernicus spacecraft observatory. The detectors, InSb, were arranged so that 1.65 and 2.2 micrometer broadbend photometry was performed through a common diaphragm. The measurements were used to determine the energy distribution during a flare and thus learn about the infrared spectrum and its changes during the flare. M.M.M.

N79-34131*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HEAO-A2 OBSERVATIONS OF THE X-RAY SPECTRA OF THE CENTAURUS AND A1060 CLUSTERS OF GALAXIES
R. Mitchell (Cambridge Univ., England) and R. Mushotzky (NAS/NRC) Oct. 1979 30 p
(NASA-TM-80566) Avail: NTIS HC A03/MF A01 CSCL 03A

The X-ray spectral observations of two low luminosity clusters of galaxies, Centaurus and A1060, are presented. An emission feature of the Centaurus cluster at 7.9 keV is detected at about one third of the strength of the 6.7 keV line. This higher energy line represents K sub beta emission from highly ionized iron. An isothermal model with an Fe emission line is discussed and it is shown that the model cannot fit the data of the Centaurus or the A1060 clusters. The implications of the two component nature of the continuum on the Fe abundance and the X-ray surface brightness distribution are discussed. A.W.H.

N79-34120*# National Aeronautics and Space Administration, Washington, D. C.
STELLAR AND GALACTIC ASTRONOMY
In its Skylab's Astron. and Space Sci. 1979 p 7-26 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N79-34132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ELEMENTAL ABUNDANCES IN A TYPE I SNR
R. H. Becker, S. Holt, B. W. Smith, N. White, E. Boldt, R. Mushotzky, and P. Serlemitsos Sep. 1979 13 p refs Submitted for publication
(NASA-TM-80561) Avail: NTIS HC A02/MF A01 CSCL 03C

The solid state spectrometer on the HEAO-2 X-ray observatory observed the X-ray spectrum of Tycho's SNR. The observations show a relative excess of line emission from Si, S, and Ar by > or = 6 compared to that expected from a plasma of solar composition in collisional equilibrium and by a factor of > or = 3 compared to Cas A. Similar excesses are not found for line emission from Mg and Fe. The data suggest that the SN observed by Tycho in 1572 produced significant amounts of Si group elements but did not eject large amounts of Fe as predicted by some models of Type I SN events. Author

N79-34133*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY SECTOR BOUNDARIES, 1971 - 1973
L. Klein and L. F. Burlaga Sep. 1979 35 p refs Submitted for publication
(NASA-TM-80565) Avail: NTIS HC A03/MF A01 CSCL 03B

Eighteen interplanetary sector boundary crossings observed at 1 AU by the magnetometer on the IMP-6 spacecraft are discussed. The events were examined on many different time scales ranging from days on either side of the boundary to high resolution measurements of 12.5 vectors per second. Two categories of boundaries were found, one group being relatively thin and the other being thick. In many cases the field vector rotated in a plane from one polarity to the other. Only two of the transitions were null sheets. Using the minimum variance analysis to determine the normals to the plane of rotation, and assuming that this is the same as the normal to the sector boundary surface, it was found that the normals were close to the ecliptic plane. An analysis of tangential discontinuities contained in 4-day periods about the events showed that their orientations were generally not related to the orientations of the sector boundary surface, but rather their characteristics were about the same as those for discontinuities outside the sector boundaries. Author

N79-34134*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
X-RAY EVIDENCE FOR ELECTRON-ION EQUILIBRIUM AND IONIZATION NONEQUILIBRIUM IN YOUNG SUPERNOVA REMNANTS
Steven H. Pravdo (Maryland Univ.) and Barham W. Smith (Maryland Univ.) Sep. 1979 18 p refs
(NASA-TM-80558) Avail: NTIS HC A02/MF A01 CSCL 03C

The A-2 spectroscopy experiment on HEAO 1 detected X-ray emission up to 25 keV from the supernova remnants Cas A and Tycho. The spectra must include continuum components with effective temperature equivalent or > 10 to the 8th power K which could arise from optically thin plasmas in the collisionless shock fronts. This is the first indication of electron-ion temperature equilibrium in the expanding shell of young remnants. Measurements of the equivalent widths of the K alpha and K beta iron line blends in Cas A, show that their ratio is not compatible with the measured X-ray temperature in the collisional ionization equilibrium model. The search for hard X-ray pulsars in both remnants was unsuccessful. A.R.H.

N79-34135*# National Aeronautics and Space Administration, Washington, D. C.
GENERAL PROPERTIES OF HII REGIONS IN GALAXIES
M. A. Smirnov and B. V. Komberg Oct. 1979 33 p refs Transl. into ENGLISH of Obshchiye Svoystva zon HII v Galaktikakh (Moscow), report PR-315, 1977 p 1-38 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original document prepared by Academy of Sciences (USSR), Moscow
(Contract NASw-3199)
(NASA-TM-75700) Avail: NTIS HC A03/MF A01 CSCL 03B

The structure, electron density, and dimensions of HII regions in galaxies are discussed. These parameters are correlated to the chemical composition gradient along the galactic radius, the dimensions of the three largest HII regions in the galaxy, and the amount of hydrogen in the galaxy, as well as the mass, dimensions, and total optical luminosity of the galaxy. The relationships of HII regions to star formation and galactic nucleus activity are discussed and the kinematic properties of the SB and Sab galaxies are related to the size of HII regions. K.L.

N79-34121*# National Aeronautics and Space Administration, Washington, D. C.
INTERPLANETARY DUST
In its Skylab's Astron. and Space Sci. 1979 p 27-42 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N79-34136 Toledo Univ., Ohio.
THE PRODUCTION AND SPATIAL DISTRIBUTION OF OBSERVED MOLECULAR FRAGMENTS IN COMETARY COMAE Ph.D. Thesis
Michael Raymond Combi 1979 167 p
Avail: Univ. Microfilms Order No. 7921351

The brightness profiles of ions and neutrals were constructed from spectrograms of Comets Bennett and West. A re-evaluation of photochemical models of the cometary coma was done. Monte Carlo simulations of realistic photochemical models showed that Haser's model can adequately describe the spatial distribution of neutral species, but that the 'measured' scale lengths are only 'lower limits' to the actual scale lengths found from the velocity of a species and its lifetime against photodissociation by the solar ultraviolet. The apparently short parent scale lengths found to date are in fact consistent with theoretical photodissociation lifetimes. Dissert. Abstr.

N79-34137*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A CATALOG OF JOVIAN DECAMETER-WAVE RADIO OBSERVATIONS FROM 1957 - 1978
J. R. Thieman Aug. 1979 37 p refs
(NASA-TM-80308) Avail: NTIS HC A03/MF A01 CSCL 03B

Data from over 200,000 hours of observation of Jupiter radio emission in the decameter-wavelength band, were collected from 13 observing sites and are available on magnetic tape. Observations were made at 14 fixed frequencies from 5 to 30 MHz. The characteristics of the tape recording technique and the data format are described. The combination of overlapping data from observing sites scattered world-wide lessens the effect of the earth's daily interruption of the ground-received signal. A power spectral analysis of the data shows no evidence of

periodicities within the data other than the well-known influences of Jupiter, Io, and the earth. The dependence of the occurrence probability of emission on System 3 longitude and the phase of Io varies smoothly with frequency down to 15 MHz and then appears quite different at 10 MHz. The morphology of the radio sources is both complex and stable for periods of at least months and probably much longer. A.R.H.

N79-34138*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD STUDIES AT JUPITER BY VOYAGER 2: PRELIMINARY RESULTS
N. F. Ness, M. H. Acuna, R. P. Lepping, L. F. Burlaga, K. W. Behannon, and F. M. Neubauer Aug. 1979 27 p refs Submitted for publication
(NASA-TM-80556) Avail: NTIS HC A03/MF A01 CSCL 03B

The Voyager 2 magnetic field experiment is described and compared to the Voyager 1 experiment and data. The magnetosphere, the bow shock, the magnetopause, and the extended magnetic tail of Jupiter are discussed. Two crossings of the near equatorial current sheet were observed in the magnetosphere and its tail every 10 hour rotation period of the planet. A definitive mapping of the geometry and character of these enhanced plasma and depressed magnetic field regions is discussed. The interaction of the satellite Ganymede with the Jovian magnetosphere, which leads to disturbances as the Jovian magnetosphere corotates with the planet past the satellite is analyzed. A.W.H.

N79-34122*# National Aeronautics and Space Administration, Washington, D. C.
OBSERVATIONS OF COMET KOHOUTEK
In its Skylab's Astron. and Space Sci. 1979 p 43-64 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N79-34139 Indiana Univ., Bloomington.
THE LARGE-SCALE INTERACTION OF THE SOLAR WIND WITH COMETARY PLASMA TAILS Ph.D. Thesis
Malcolm Bowen Niedner 1979 285 p
Avail: Univ. Microfilms Order No. 7921301

Comet Kohoutek 1973f was monitored extensively in late-1973 and early-1974, and exhibited a broad range of plasma tail behavior. On 1974 January 20, the tail was in a highly disturbed condition. The IMP 8 satellite in earth orbit was taking measurements of the solar wind and interplanetary magnetic field. Comparison of the observed tail geometry on January 20 with the theoretical position angles generated from the wind sock theory of plasma tails and the corotated satellite observations shows that the tail disturbance was probably caused by large gradients of the polar component of the solar-wind velocity. The study provides perhaps the first conclusive case of an association between a comet tail and a solar-wind event, and it suggests that the wind sock model gives a valid description of the large scale orientation of plasma tails. Dissert. Abstr.

N79-34140 Pennsylvania State Univ., University Park.
THE SOLAR BRIGHTNESS TEMPERATURE SPECTRUM IN THE MILLIMETER REGION Ph.D. Thesis
Richard Arlan Kuseski 1979 110 p
Avail: Univ. Microfilms Order No. 7922304

A technique for obtaining the absolute solar brightness temperature in the millimeter region is proposed. Using this technique, the ratio of the solar brightness temperature to that of the lunar brightness temperature at a particular frequency is measured. These ratios can then be converted to an absolute solar brightness temperature by choosing an appropriate lunar brightness temperature spectrum. The frequencies used are 33.9, 36.0, 37.75, 90.0 and 93.0 GHz. Two different radiometers were used, one operating at approximately 36 GHz and the other operating near 93 GHz. They were both superheterodyne, Dicke switched receivers. Dissert. Abstr.

N79-34141*# Solar Physics Research Corp., Tucson, Ariz.
[ENERGY TRANSPORT THROUGH THE SOLAR ATMOSPHERE] Final Technical Report
Karen L. Harvey and John W. Harvey 31 Aug. 1979 38 p refs
(Contract NAS8-33104)
(NASA-CR-161316) Avail: NTIS HC A03/MF A01 CSCL 03B

The energy transport through the solar atmosphere and the source of energy which heats the chromosphere and the solar corona are studied. Wave propagation in the solar atmosphere and in the heating of the solar atmosphere is discussed as a source and transport medium. The source of the waves is thought to be the photospheric short period oscillations. Simultaneous observations from the photosphere to the corona at the solar disk center are reported. Emphasis is on the possible association of aperiodic brightenings high in the atmosphere with specific events in the photosphere. A.W.H.

N79-34142*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROSCALE INSTABILITIES IN STREAM INTERACTION REGIONS
Aharon Eviatar (Tel-Aviv Univ., Israel) and Melvyn L. Goldstein Aug. 1979 51 p refs Submitted for publication
(NASA-TM-80560) Avail: NTIS HC A04/MF A01 CSCL 03B

The microstructure of solar wind stream interaction regions is considered theoretically with emphasis on the role of several electrostatic kinetic instabilities which may be important within the stream interface and the compression region. Inside of 1 AU, the interface is likely to be stable against the electrostatic streaming instabilities considered. Between 1 and 2 AU, the interface will excite the magnetized ion-ion instability. The compression region is also found to be unstable beyond 1 AU where the modified two-stream instability, beam-cyclotron instability, and ion-acoustic instability are important in determining the structure of the compressive pulses as they evolve into forward and reverse shocks. It is concluded that the modified two-stream instability and beam-cyclotron instability predominately play a role in heating the electrons to the threshold for the ion-acoustic instability. Various electrostatic plasma waves, ranging in frequency from the lower-hybrid to harmonics of the electron cyclotron frequency, would be produced by these instabilities. Their signature should also be seen by high time resolution measurements of the temperature of the various plasma species. A.R.H.

N79-34143*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE HARD X-RAY BURST SPECTROMETER ON THE SOLAR MAXIMUM MISSION
L. E. Orwig, K. J. Frost, and B. R. Dennis Aug. 1979 25 p Submitted for publication
(NASA-TM-80337) Avail: NTIS HC A02/MF A01 CSCL 03B

The primary scientific objective of the spectrometer is to provide a greater understanding of the role of energetic electrons in solar flares. This will be achieved by observations of high energy X-rays in the energy range from 20 to 200 keV with time resolution of 0.128s on a continuous basis and as short as 1 ms for limited intervals. The X-ray detector is an actively shielded CsI(Na) crystal with a thickness of 0.635 cm and a sensitive area of 71 sq cm. In the first year after launch, it is expected that approximately 1000 flares above the sensitivity threshold of 0.2 photons/(sq cm s) lasting for one second, will be detected. A.R.H.

N79-34144*# Colorado Univ., Boulder.
STUDY OF THE SOLAR CORONA USING RADIO AND SPACE OBSERVATIONS Final Technical Report, 1 Oct. 1978 - 31 Oct. 1979
George A. Dulk 31 Oct. 1979 12 p refs
(Grant NsG-7287)
(NASA-CR-162367) Avail: NTIS HC A02/MF A01 CSCL 03B

Optical, radio and X-ray evidence of violent mass motions in the corona has existed for some years but only recently have the form, nature, frequency and implication of the transients become obvious. The observed properties of coronal transients concentrating on the white-light and radio manifestations. The possible mechanisms involved in the radio bursts are discussed. The estimates of various forms of energy are reviewed. It appears that the magnetic energy transported from the Sun by the transient exceeds that of any other form, and that magnetic forces dominate in the dynamics of the motions. The conversion of magnetic energy into mechanical energy, by expansion of the fields, provides a possible driving force for the coronal and interplanetary shock waves. G.Y.

N79-34145# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 416, APRIL 1979. PART 1: PROMPT REPORTS, DATA FOR MARCH 1979, FEBRUARY 1979
Apr. 1979 169 p 2 Vol.
(PB-297218/0; SGD-416-Pt-1; NOAA-79051502-Pt-1) Avail: NTIS HC A08/MF A01 CSCL 03B

Data is provided for March 1979 on: alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, coronal holes, solar wind measurements, inferred interplanetary magnetic field polarities, mean solar magnetic field and Boulder geomagnetic substorm log. It also provides data for February 1979 on: daily solar activity center, sudden ionospheric disturbances, solar X-ray radiation, solar radio emission, cosmic rays, geomagnetic indices, and radio propagation indices. GRA

N79-34146# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 416, APRIL 1979. PART 2: COMPREHENSIVE REPORTS, DATA FOR OCTOBER 1978, SEPTEMBER 1978, AND MISCELLANEA
Helen E. Coffey Apr. 1979 114 p 2 Vol.
(PB-297219/8; SGD-416-Pt-2; NOAA-79051503-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 03B

Data is provided for October 1978 on: active regions, synoptic solar maps, solar flares, solar radio emission, energetic solar particles and plasma, and solar X-ray radiation. It also provides synoptic charts, abbreviated calendar record and regional flare index for September 1978. The miscellaneous data includes: solar X-ray radiation, cosmic rays, geomagnetic indices for January 1979 and energetic solar particles and solar X-ray radiation for September 1978. GRA

N79-34147# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 417, MAY 1979. PART 1, (PROMPT REPORTS): DATA FOR APRIL 1979-MARCH 1979
Helen E. Coffey May 1979 166 p
(PB-297447/5; SGD-417-Pt-1; NOAA-79061402) Avail: NTIS HC A08/MF A01 CSCL 03B

Data is provided for April 1979 on: alert periods, daily solar indices, solar flares, solar radio emission, spacecraft observations, coronal holes, inferred interplanetary magnetic field polarities, mean solar magnetic field, solar wind measurements, and Boulder Geomagnetic Substorm Log. It also provides data for March 1979 on: daily solar activity center, sudden ionospheric disturbances, solar X-ray radiation, solar radio emission, cosmic rays, geomagnetic indices and radio propagation indices. GRA

N79-34148# National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NUMBER 415, MARCH 1979. PART 2 (COMPREHENSIVE REPORTS): DATA FOR SEPTEMBER 1978, AUGUST 1978 AND MISCELLANEA
Helen E. Coffey May 1978 84 p
(PB-296276/9; SGD-415-Pt-2; NOAA-79041606) Avail: NTIS HC A05/MF A01 CSCL 03B

The data on active regions, synoptic solar maps, solar flares, solar radio emission, and energetic solar particles and plasma are presented from September, 1978. A synoptic chart, abbreviated calendar record, and regional flare index for August 1978 are provided. The miscellaneous data includes: solar radio emission, cosmic rays for December 1978, and solar-terrestrial activity 1977. GRA

N79-34149# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
ANNOTATED ATLAS OF H-ALPHA SYNOPTIC CHARTS FOR SOLAR CYCLE 20 (1964-1974) CARRINGTON SOLAR ROTATIONS 1487-1616
Patrick S. McIntosh Feb. 1979 326 p refs
(PB-296477/2; UAG-70) Avail: NTIS HC A15/MF A01 CSCL 03B

A record of large-scale solar magnetic fields and solar activity during 130 solar rotations, from November 1964 through July 1974 in the form of H-alpha synoptic charts and accompanying descriptive notes is presented. A perspective on large-scale magnetic fields is provided by the inference of lines of polarity reversal from the systems of structures visible in H-alpha patrol filtergrams. These structures map the neutral lines in the radial component of solar magnetic fields, thereby revealing details of the boundaries to large-scale magnetic fields that are not recorded in magnetograms sensitive to the longitudinal (line-of-sight) component of the fields. This atlas testifies that neutral lines are of themselves important physical features in solar activity. They are associated directly with systems of physical structures. They form continuous lines that often encircle the entire sun. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N79-34150 Wisconsin Univ. - Madison.
ANALYSIS OF LINE FORMATION IN STELLAR WINDS Ph.D. Thesis
William Michael Rumpl 1979 139 p
Avail: Univ. Microfilms Order No. 7916585

Two aspects of line formation in stellar winds are presented under the following titles: (1) A Wind Model with Enhanced equatorial Mass Loss Rate and Its Application to HD 50896; and (2) The Effect of Nonlocal Radiative Coupling on the Formation of Doublets in Stellar Winds. Dissert. Abstr.

N79-34151 Indiana Univ., Bloomington.
EXTENDED RADIO SOURCES IN THE CLUSTER ENVIRONMENT Ph.D. Thesis
Jack ONeal Burns, Jr. 1979 353 p
Avail: Univ. Microfilms Order No. 7921278

Extended radio galaxies which lie in rich and poor clusters were studied through observations with the NRAO 300 ft single dish telescope, the Green Bank interferometer and the VLA. Detailed total intensity and polarization observations for a more restricted sample of two classical double sources and nine head-tail galaxies were also performed with the NRAO interferometer. The rich and poor radio cluster samples are combined to investigate the relationship between source morphology and the scale sizes of clustering. Potentially fruitful areas of future cluster research of X-ray, optical, and radio frequencies are discussed. In particular, the probability of detecting poorer clusters with future X-ray satellites is addressed. Dissert. Abstr.

N79-34152# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
OBSERVATIONS OF EXTRATERRESTRIAL GAMMA RAY BEAMS USING A HIGH ANGULAR RESOLUTION TELESCOPE [OBSERVACOES DE FONTES DE RAIOS GAMA EXTRATERRESTRES COM UM TELESCOPIO DE ALTA RESOLUCAO ANGULAR]
J. O. D. Jardim, K. R. Rao, O. D. deAguiar, and I. M. Martin Jun. 1979 10 p refs In PORTUGUESE Presented at the 6th Reuniao Anual da Soc. Astron. Brasil. - SAB, 4-6 Jul. 1979

Revised
(INPE-1498-RPE/040) Avail: NTIS HC A02/MF A01

Results are presented of measurements made using a high angular resolution telescope of low energy Gamma rays in the region of 0.34-5MeV. Observations of the origin of Sco X-1 in the Galactic Center during this flight are reported.
Transl. by M.M.M.

N79-34153# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE FROZEN-IN EFFECT OF COSMIC PLASMAS [EFEITO DO CONGELAMENTO (FROZEN-IN) EM PLASMAS ESPACIAIS]
Rene A. Medrano-B. Jul. 1979 10 p refs In PORTUGUESE
(INPE-1530-RPE/062) Avail: NTIS HC A02/MF A01

The frozen-in effect and the diffusion of the solar wind and its interactions with planetary and comet ionospheres lacking intrinsic magnetic fields is presented. It was concluded that depending on the ionospheric conductivity, a neutral layer can be formed in the ionosphere. The qualitative models depict the case of two comets when they are in the vicinity and away from the sun respectively. M.M.M.

N79-34154# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
GAMMA NUCLEAR LINES PRODUCED IN SUPERNOVAE AND THE POSSIBILITY OF DETECTION [LINHAS GAMA NUCLEARES PRODUZIDAS EM SUPERNOVAS E POSSIBILIDADE DE DETECCAO]
Jeronimo O. D. Jardim Jul. 1979 16 p refs In PORTUGUESE
Presented at the 31th Reuniao Annual da Soc. Brasil. para o Progr. da Cienc. (SBPC), 11-18 Jul. 1979 Revised
(INPE-1517-RPE/053) Avail: NTIS HC A02/MF A01

The nuclear fusion reaction which results in the origin of a supernova is studied. These explosive nuclear synthesis occur between two elements of atomic weights between 28 and 57 as well as in reactions produced by high energy particles surrounded by gas. In the Galaxy N6C5236 the nuclear Gamma lines are best observed, since there are more of these phenomenons occuring there. Transl. by M.M.M.

N79-34155*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASYMPTOTIC FREEDOM IN THE EARLY BIG-BANG AND THE ISOTROPY OF THE COSMIC MICROWAVE BACKGROUND
F. W. Stecker Sep. 1979 13 p refs Submitted for publication
(NASA-TM-80562) Avail: NTIS HC A02/MF A01 CSCL 03B

The isotropy of the universal 3K background radiation is discussed and a superunified field theory incorporating gravity and possessing asymptotic freedom is suggested to provide a solution to the problem. Thermal equilibrium is established in this context through interactions occurring in a temporally indefinite preplanckian era. A.W.H.

N79-34156# California Univ., Berkeley. Lawrence Berkeley Lab.
COSMIC MICROWAVE BACKGROUND: PRESENT STATUS AND FUTURE PROSPECTS
Richard A. Muller Dec. 1978 18 p refs Presented at 13th Tex. Conf. on Relativistic Astrophys., Munich, 14-20 Dec. 1978 (Contract W-7405-eng-48)
(LBL-8799; Conf-781245-1) Avail: NTIS HC A02/MF A01

The origin of cosmic background radiation is discussed according to the standard model for the origin of the Universe. Current measurements of the black body radiation spectrum and the large-scale isotropy are examined. Proposed experiments for NASA's cosmic background explorer (COBE) satellite include measuring the spectrum from 3.3 to 0.33 mm, the anisotropy at four frequencies, and the diffuse infrared background. DOE

N79-34123*# National Aeronautics and Space Administration, Washington, D. C.
ENERGETIC PARTICLES
In its Skylab's Astron. and Space Sci. 1979 p 65-78 (For primary document see N79-34118 24-88)
Avail: NTIS MF A01; SOD HC CSCL 03B

99 GENERAL

N79-34157# National Bureau of Standards, Washington, D. C.
DIMENSIONS/NBS, VOLUME 63, NO. 4, APRIL 1979
Apr. 1979 28 p See also PB-292185 and PB-296268 Original contains color illustrations
(PB-296240/5; NBS/DIM-63/4) Avail: NTIS HC A03/MF A01 CSCL 14B

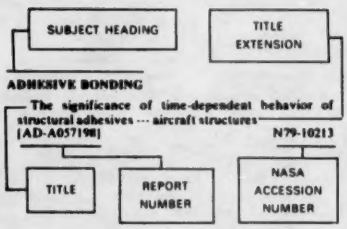
This monthly magazine features short summaries of major technical developments, highlights of work in progress, major speeches and statements by Bureau management, and a listing of NBS publications. The table of contents for the current issue is: Giving a Robot the Eye, M. Baum; Arabian Days and Nights at NBS, M. Heyman; Summer Energy-Saving Tips, M. Heymam; Government Adopts Three Computer Interface Standards, S. Lichtenstein; Cryogenic Temperature Reference Device, R. Soulen; A Methodology for Selecting Interactive Computer Services, S. Mamrak; River Sediment and Urban Particulate SRM's; Conferences, Publications; News Briefs. GRA

N79-34158# National Bureau of Standards, Washington, D. C.
DIMENSIONS/NBS, VOLUME 63, NO. 5, MAY 1979 Monthly Report
May 1979 32 p
(PB-296268/6; NBS/DIM-63/5) Avail: NTIS HC A03/MF A01 CSCL 14B

The contents are: (1) Impossibility of Group Decisions, C. Johnson; (2) Space Behaves as Einstein Expected, D. Orr; (3) Colder Than OLD, K. Armstrong; (4) Small Computer Systems Excluded from Interface Standards, S. Lichtenstein; (5) A Powerhouse at NBS-Properties of Steam, A. L. Sengers; (6) Standard Reference Material for Scanning Electron Microscopy Reissued, D. Ballard; (7) Two Aluminum SRM's Available; and (8) Conferences, Publications and News Briefs. GRA

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

A-10 AIRCRAFT
A-10 static structural test program
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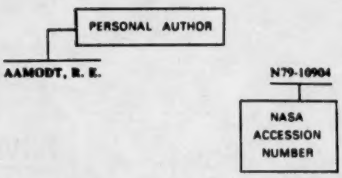

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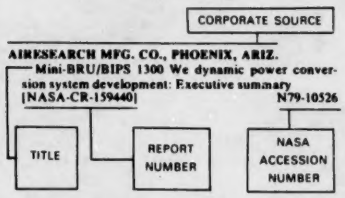

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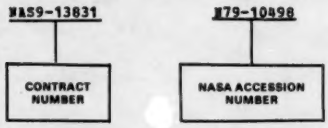

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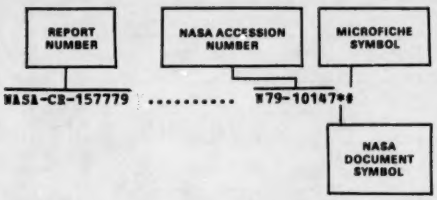

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